

STATISTICAL COMMISSION and
ECONOMIC COMMISSION FOR EUROPE

COMMISSION OF THE EUROPEAN
COMMUNITIES (EUROSTAT)

CONFERENCE OF EUROPEAN STATISTICIANS

ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

Joint UNECE/Eurostat/OECD
Meeting on National Accounts
(Paris, 3-6 June 1997)

Item 3 of the provisional agenda

**METHODS USED TO ESTIMATE STOCKS OF FIXED ASSETS AND CONSUMPTION OF FIXED
CAPITAL IN TRANSITION COUNTRIES - ECE**

Submitted by ECE secretariat ¹

1 Prepared by Lidia Bratanova, ECE Statistical Division.

I. Introduction

A. Background

At the last national accounts meeting, held in Geneva, 30 April-3 May 1996, the ECE secretariat was asked to carry out a survey on the methods currently used by transition countries for estimating the stocks of fixed assets and the consumption of fixed capital and to prepare a summary paper for the present Joint ECE/OECD/Eurostat national accounts meeting. The work on the survey was discussed with the Statistical Committee of CIS and OECD. Experts on capital stock from the statistical agencies of Hungary, Denmark and the Netherlands contributed to the preparation of the survey with comments and suggestions.

The idea was that the survey would provide information on the practices and methods used in transition countries, as well as on the problems encountered by them. The summary of the results should provide an opportunity for exchange of experience between the countries and contribute to discussions in this important area, which often presents difficulties for national accounts experts. The optimistic goal was that it might provide a basis for the development of recommendations to the transition countries.

It was also thought that, based on the results of the first attempt to analyze the problems of transition countries in estimating the stocks of fixed assets, the experts from national statistical agencies and international organisations might consider, if appropriate, further development of the work in this area. Therefore, it should be made clear that the present paper is regarded as work-in-progress which will need to be developed in future.

B. Valuation of stocks of fixed assets

Valuation of stocks of fixed assets and the consumption of fixed capital represents one of the major unresolved problems in national accounts of transition countries. Continued use of the methods from the period of central planning would result in incorrect estimates of the value of stocks of fixed assets. Without reasonable estimates of capital stock, no meaningful figures for fixed capital consumption can be obtained.

Transition countries use various methods to cope with the problem of estimating the value of stocks of fixed assets and consumption of fixed capital under conditions of high inflation and profound structural changes in the economy. At the same time, book-keeping data of enterprises refer to depreciation made on the basis of the historic value (price of acquisition) of fixed assets. Regular annual revaluations of fixed assets are carried out at enterprise level in many transition countries, on the basis of which consumption of fixed capital is calculated. However, in some countries, such revaluations still do not always give satisfactory results.

The 1993 SNA recommends that consumption of fixed capital should be calculated taking account of the actual service lives of the assets concerned and be valued at current replacement cost. However, very little information on the service lives of fixed assets is available, which makes the

introduction of new methods extremely difficult.

There are two broad approaches to estimation of capital stock: direct estimation and the Perpetual Inventory Method (PIM). PIM is the method largely recommended and is used in most developed market economies to derive capital stock estimates. PIM uses estimates of gross fixed capital formation over a long time period combined with assumptions over the length of asset lives and the pattern of the retirement of assets in a simple model. Direct estimation, as its name implies, involves measuring directly the stock of fixed capital available to industry.

C. The survey

The main purpose of the survey was to collect information on the primary statistics of stocks of fixed assets available in the transition countries and the methods used, so as to have a better picture of the situation in these countries.

In view of the objectives mentioned above, a short questionnaire, comprising six major groups of questions was designed and sent to all transition countries (27 ECE member countries in transition). The questionnaire asked for information on: coverage of fixed assets; sources of data (statistical surveys, business accounts, other sources); classifications used; methods used to estimate the value of capital stock; coverage, concepts and methods used in calculating consumption of fixed capital; coverage, disaggregation and methods for estimation of gross fixed capital formation (GFCF) at current and at constant prices.

Countries were requested to supply information on the availability of primary statistics on **produced fixed assets** (as defined by 1993 SNA) in transition countries. It was thought that information on the different sources of data and methods currently used for making estimates would be essential in planning further development of the existing methods or development of new ones in the future. Inventories, work-in-progress and valuables (the rest of produced assets) and non-produced assets (land, subsoil assets) were excluded from the survey.

The emphasis was placed on **tangible fixed assets**, namely: dwellings; other buildings and structures; machinery and equipment (of which transport equipment as a separate sub-heading); cultivated fixed assets (livestock for breeding, dairy, etc., and vineyards, orchards and other plantations of trees yielding repeat products). Detailed information was requested on all these. The 1993 SNA specifies that the value of **intangible fixed assets**, such as mineral exploration, computer software and literary and artistic originals, should also be included in the value of stocks. For these intangible assets only general information was requested because it was assumed that countries in transition are unlikely to make such estimates.

Countries' experts were encouraged to answer the questionnaire with written descriptions. They were also requested to indicate major weaknesses they perceived in their estimates and to share any ideas they might have on how to resolve a particular problem. The experts were requested to provide explanations of specific problems encountered during the transition process,

such as privatization, sales between sectors, high rates of inflation and change in coverage of the gross fixed capital formation (GFCF).

D. The response

The response to the survey was high - 85 percent - out of 27 surveyed transition countries only four did not provide an answer, namely: Armenia, Azerbaidjan, Bosnia and Herzegovina and Turkmenistan. Countries provided information with different degrees of detail. Some of them sent quite comprehensive descriptions and explanations and submitted other relevant material such as tables with data and even articles published in their countries. Other countries answered the questions briefly with just a few sentences.

The information revealed some common practices used by the countries, and similar problems encountered. However, the ECE did not have time to go back to countries in cases where some further queries needed to be answered in order for the situation to be cleared. Therefore, some of the information provided by them was not included. It was hoped that this additional research could be carried out at a future time.

All respondents expressed their strong support for the survey. Practically all countries expressed the hope that the work on measurement of capital stock and its estimation in transition countries would continue.

II. Methods of estimating the value of fixed assets

Countries were asked to provide brief descriptions of the methods they presently use to estimate the value of fixed assets. As was mentioned earlier the emphasis was placed on the four major types of tangible fixed assets: dwellings; other buildings and structures; machinery and equipment, including transport vehicles; and cultivated assets as defined by the 1993 SNA. Information on sources of data was also requested.

In general, there are two main procedures currently followed by transition countries in estimating the stock of fixed assets - annual surveys of fixed assets and direct observations of the stock of fixed assets in combination with the PIM technique. The majority of the countries carry out annual surveys of fixed assets. In addition, because of the high rates of inflation experienced during the last several years by most of them, regular revaluations of the fixed assets are carried out. As a result of this revaluation, fixed assets purchased at different prices are revalued at the prices of the current period. This is done by using the most appropriate price indices (from the available ones) for fixed assets.

Hungary is a special case as the estimation of stock of fixed assets and consumption of fixed capital has been suspended since 1991. Prior to 1991, estimation of assets was based on information taken from annual financial surveys of all enterprises and government institutions.

The Survey showed that at present transition countries can be

conditionally divided into four groups, depending on the methods used, as follows:

- The first group consists of those transition countries which have started using the PIM method for estimation the value of fixed assets or have done some experimental work on its implementation. Only two countries are presently using PIM technique, these are the Czech Republic and Slovenia. Poland has done some experimental work on the implementation of PIM but the results have not been reflected in the accounts, and Hungary has done some experimental calculations using a "vintage " method to recalculate retrospective data;

- The second group consists of the countries which estimate the value of capital stock on the basis of annual statistical surveys without applying, or only occasionally applying, revaluation procedures for estimating the value of assets. This group includes countries such as Bulgaria, Estonia, Latvia, Lithuania, FYR of Macedonia, Yugoslavia;

- The third group comprises Russian Federation and the rest of CIS countries, which carry out annual statistical surveys of fixed assets, supplemented by regular revaluations of the value of fixed assets practically every year since the beginning of the transition period. Another specific feature is the annual compilation of balance of fixed assets (BFA) which is discussed further in this paper;

- The fourth group consists of those countries which presently do not carry out any survey for estimating stocks of fixed assets. Albania and Croatia reported that they had not started any work on measurement of capital stock.

A. Direct observation of the stock of fixed assets in combination with PIM

The Perpetual Inventory Method is the method largely recommended; it is used by OECD countries to derive the estimates of capital stock. In order to apply the PIM, four types of information are required : the value of the stock in an initial period, capital formation in each year after the starting point, the length of time that assets remain in the capital stock, i.e. asset service lives, before being withdrawn and changes in the prices of capital assets (see "Methods used by OECD countries to measure stocks of fixed capital", Statistics Directorate, OECD, Paris 1993).

As mentioned above the PIM method is presently applied by two transition countries - the Czech Republic and Slovenia.

The experience of the Czech Republic

It seems that Czech Republic has the most experience among transition countries in applying the PIM. The last direct observation of capital stock (before the implementation of new techniques) at historic cost was carried out in 1991 and the estimates were expressed at 1984 prices. The results of that survey were taken as a starting point for further development of the estimates by type of assets.

At present the valuation of stock of dwellings is somewhat problematic because of the lack of appropriate statistics. Reliable information on the loss of dwellings is not available and this is seen as a major problem. Therefore, only a rough estimate of the value of stock of dwellings can be made at present. The additions and deductions from the value of the stock of dwellings, last surveyed on 31 December 1991, is done on the basis of information from various sources, such as: number of issued building permits and number of houses constructed (quarterly data); number and value of completed dwellings (continuously); and data about the value of investments made by enterprises to acquire new and existing dwellings (annual data from 1995). Since the beginning of 1997 a new quarterly survey collects data about number of demolished (lost) dwellings. In addition a separate price index especially compiled for revaluing the dwelling stock will replace the general price index for buildings and structures which has been used until now.

It is expected that the Census of population and dwellings, which is planned for the year 2001 will provide the necessary information for updating the value of stock of dwellings. At the moment the only information on dwellings, directly collected by the statistical agency, refers to those NACE Rev.1 codes which are subject to direct observation of age structure of capital stock, but the share of these dwellings is negligible.

The method used for estimating the value of fixed assets of other buildings and structures and machinery and equipment follows the concept of periodic direct observation of tangible fixed assets in combination with the balancing between two observations. Statistical observation of age structure of capital stock is carried out annually for selected enterprises at the level of two-digit NACE codes. The selection of enterprises changes in such a way that each NACE code gets into the survey once in five years.

The value of other buildings and structures and machinery and equipment is updated using information from statistical questionnaires. These are:

- periodic direct observation of age structure of tangible fixed assets (including financial leasing) which covers all enterprises with 25 employees or more and is conducted every 5 years;
- annual survey of leasing companies (since 1995);
- annual statistical survey of enterprises by industries provide data on value of acquisitions, disposals and demolished fixed assets at historic cost (including their average age) on 1 January and 31 December;
- balance sheets of non-financial corporations and selected NPISH are used for additional information. The Ministry of Finance keeps balance sheets for budget institutions which report data about value of fixed assets at the beginning and at the end of each year.

The first pilot surveys of capital stock in Czech Republic were carried out in 1993 and 1994. Depending on the year of acquisition, appropriate price indices are then used to revalue the fixed assets at current replacement cost and at constant prices. Between the years of surveying, the estimation of tangible fixed assets is made by using data about expenditures made for the acquisition of fixed assets and the value of disposed and

demolished assets. Information on the average life of demolished assets is also used. After each direct observation of the value of capital stock, retrospective adjustments and corrections are done for the estimates made between the observations.

From 1995, the annual enterprise questionnaires provide information on acquired, disposed and demolished buildings and structures; machinery and equipment. On that basis, the value of stock is calculated following the formula: value of stock on 31 December of year X₀ + acquisitions during the year X₁ - disposals of year X₁. The observation of fixed assets acquired through financial leasing was also introduced in 1995 which complies with the recommendations of the 1993 SNA.

The estimation of stock of cultivated assets as recommended by the 1993 SNA is not done yet. Their value is estimated on the basis of information taken from balance sheets of agricultural enterprises which report data at historic cost. Currently, work is being undertaken to prepare the concept for collecting these kind of statistics, based on the assumption that prevailing part of cultivated assets is acquired on own-account. However, information on the average unit costs for the acquisition of cultivated assets is not available.

The experience of Slovenia

The last complete survey of stock of fixed assets in Slovenia which also included the value of land, was carried out for the period 1980-1987 and was conducted on 31 December 1987; the last survey of legal entities was carried out in 1990. Data on public sector were taken from business accounts of enterprises and other organisations and from the annual financial survey of industrial enterprises. For 1990-1995 the value of stock was estimated. Two sectors were distinguished. The first included non-financial and financial corporations and general government for which data were taken from business accounts. The second sector included households for which data were taken from tax authorities and from statistical surveys.

The estimation of stock of dwellings is based on information from the last population census (1991). Data are updated annually with data from construction statistics applying the PIM technique. This method of updating will be used till the next census of population and housing stock to be carried out in 2001. Updating of the value of stock of other buildings and structures, machinery and equipment is done on the basis of information from business accounts.

In estimating the value of livestock, the method of constant inventory at the end of the year is used. Information on both legal entities and households is available. Vineyards, orchards and other plantations are estimated using information from business accounts; the value of assets belonging to households is estimated on the basis of data from the agricultural census.

Experimental work on the PIM

Since December 1994 **Polish experts** have been carrying out some

experimental work on applying PIM in co-operation with French experts from INSEE, but the results of this work have not been reflected in the national accounts data. The work includes development of country methodology of the PIM taking into account the specific conditions in the national economy with characteristic changes in the organisational structure of the corporations; frequent change in the kind of economic activity of enterprises; big turnover of existing fixed assets. Another problem which has to be resolved is the transition from the old national economic classification to NACE Rev.1.

Hungary has tried to apply a simplified version of PIM which is called the "vintage model", with a pilot project carried out to produce retrospective estimates of the stock of fixed assets and consumption of fixed capital. There are plans to extend the model forwards.

The model is based on information collected through a revaluation survey of capital stock carried out in 1968 which covered all industries. Approximate estimates were made about the average service lives of fixed assets. An assumption was made for a probability density function concerning the rate of retirement of fixed assets. Then the 30-year period was broken down into two parts, so that the first one covered the period 1968-1991. The reason for that was that big economic changes took place after 1990 and it was not considered appropriate to carry forward past tendencies.

For that period (30 years) a homogeneous group of assets was chosen according to the mortality functions and expected service lives. Retirement rates were calculated based on assumed mortality functions. A model was developed of vintage type and applied to the selected group of assets by using the appropriate investment chain indices, so that estimates at current replacement cost were obtained. The model was experimented on machinery and equipment for three industries and the results are considered by the Hungarian experts as "acceptable".

An attempt was made to apply a simplified version of PIM in **Estonia**, by using information from enterprise surveys. Stocks at the beginning of the year are revalued at current replacement cost using investment price indices. Then disposals are deducted and acquisitions of fixed assets added. The previous year is taken as the base period. The results of this experiment are not considered to be very reliable.

All other CEE countries, the Baltic states and CIS member countries are either preparing or are planning the implementation of a PIM technique in the future. The Slovak Republic, for example is planning the implementation of direct observation of stock of fixed capital from the beginning of 1998. The survey will collect information for the four major types of assets.

Service lives of fixed assets

Countries were asked whether information on the service lives of fixed assets was available and, if yes, what were the sources of data.

Asset service lives are defined by the length of time that assets remain in capital stock before being withdrawn. In many developed market

economies the tax authorities prescribe the asset lives. Tax authorities may specify the number of years over which the depreciation of different types of assets may be deducted from profits before charging taxes, on which basis an estimate of service lives could be made. Another source of data are company accounts which record stocks and flows of assets at historic cost values, which can be used to estimate asset lives. Special surveys and expert advice are also often used.

The **Czech Republic** estimates the average service lives of fixed assets through a model calculation and a second estimate is derived from information collected with direct annual survey introduced in 1995. Estimates of service lives of dwellings, other buildings and structures, machinery and equipment are available.

In **Slovenia**, information on service lives for all assets is taken from the company business accounts. For their experimental work, the **Polish experts** have used company accounts, which record stocks and flows of assets at historic cost (price of acquisition), to estimate the length of time that assets remain in the capital stock. These estimates will be further compared with the average service lives of similar assets in other OECD member countries.

Expert advice about service lives of fixed assets has been used in **Hungary** to make retrospective estimates by applying a simplified version of PIM (the vintage model).

Information on service lives is available in **Romania** by type of assets. The length of service lives together with the rates of depreciation for each type of assets are approved by the government. Within the **CIS** countries, in most cases, the government prescribes or specifies the number of years over which the depreciation rates should be applied. However, it should be noted that the length of service lives approved by governments for depreciation allowances may differ from the actual service lives of the assets.

B. Annual surveys of fixed assets

Annual surveys of fixed assets is the other main approach applied in estimating the stock of fixed assets. In some transition countries the data of fixed assets are collected through statistical questionnaires, in others, the information is collected through the financial statistics. However, in both cases these surveys collect information on the value of stock of fixed assets at historic cost as recorded by enterprises in their business accounts.

Bulgaria estimates the value of stock of fixed assets on the basis of information from the annual book-keeping reports provided by the enterprises. According to national accounting standards, all enterprises keep accounts about the value of fixed assets and changes in their value during the accounting period for the major groups of assets. A specialised statistical survey which covers all economic sectors collects quarterly and annual data about the transactions with fixed assets (acquisitions, disposals,

liquidation).

Until 1991 the value of assets in **Hungary** was estimated on the basis of information from the annual financial reports of enterprises and government units. For the period 1968-1991 the assets were valued at historic cost and depreciation was calculated as a fixed percentage of historic value of assets. These data were derived directly from the enterprise accounts.

In **Poland**, the value of fixed assets is estimated annually on 31 December. This is done on the basis of information taken from statistical questionnaires which are differentiated by type of institutional units. The first group comprises non-financial corporations which are further subdivided into three groups depending on the number of employees. The second group comprises of financial institutions, insurance corporations, central government, universities. The third covers the units of local government. All questionnaires provide information on the four major types of fixed assets, including transport equipment as a separate heading.

In **Romania** fixed assets are surveyed annually on the basis of accounting balance sheets covering non-financial and financial corporations. The four major types of tangible assets are covered plus land, including expenses for major improvements. An additional source is the annual statistical survey of enterprises which also gives information on fixed assets.

The Slovak Republic has reintroduced an annual statistical survey of fixed assets in 1995 after a break of three years. All legal entities have duty to report accounting data, with the help of statistical questionnaires, to the statistical agency. Data are reported by type of assets separately in the following breakdown: land; buildings and structures; machinery and equipment; transport equipment; furniture and other office equipment; fruit-bearing plants; breeding and dairy livestock; works of art and precious metals; other tangible assets. The questionnaires provide data about the value of stock at the beginning and at the end of the year as well as the changes in fixed assets during the reference period. For the period 1993-1995, only the total value of tangible and intangible fixed assets at historic cost is available.

Statistical data on fixed assets are collected differently by institutional sectors in **Estonia**. An annual survey covering all enterprises with 19 and more employees collects information on the four major type of assets. For smaller enterprises sample surveys are used. Non-financial corporations provide the most detail data, where the most complete data on fixed assets could be found in the financial reports provided by financial corporations. The Ministry of Finance provides data on government sector. Capital stock is valued at historic, full cost, except in the financial sector, where depreciated value of fixed assets is used.

on the basis of information from local authorities on new registered housing in physical terms which are then converted into values by using average prices of construction works per sq. metre. Another useful source is the local registers of vehicles, where the new tractors are registered and this information is used to adjust the value of fixed assets in private sector.

A new accounting system, which was implemented in **Latvia** in 1993, recommended the introduction of new form of balance sheets. The main source of information on non-financial corporations is a statistical form called "Report on the financial situation of enterprises". Information on value of capital stock in general government sector is taken from the central and local government budgets which give details by type of assets and include the following items: buildings and structures; dwellings; land; machinery and equipment; transportation vehicles; hardware; breeding and dairy livestock; library stock; other. To estimate the value of fixed assets of household sector similar sources of data as in Estonia are used.

In **Lithuania**, the value of stock of dwellings is estimated using information from construction statistics. An annual survey of collects information from the book-keeping accounts of the enterprises on the basis of which the value of machinery and equipment is estimated. Data are cross-checked using a commodity flow method, i.e. output plus import minus export of machinery and equipment. Information on investment expenditures is collected annually and quarterly.

The FYR of Macedonia estimates the value of stock of fixed assets through an annual survey which collects data from the balance sheets of all large enterprises (about 2000). Information on the value of stocks of small private enterprises (about 2800 legal units) is taken from the financial reports which the units provide to a specialised agency, called Bureau of Payments. The major types of fixed assets, including cultivated assets are covered.

C. Practice in CIS countries

Balance of Fixed Assets (BFA)

The balance of fixed assets was one of the balances traditionally compiled in the Material Product System (MPS). It is still in use in Russian Federation and other CIS member countries. The Balance represents a statistical table which characterises the value, structure and change in value of fixed assets for the economy as a whole, by industries and by forms of ownership. It is compiled by the statistical agencies and can be developed on national and regional level. The stock of assets is estimated at full value and at depreciated value (i.e. after consumption of fixed capital). Different concepts of valuation of fixed assets are used to estimate the stock of fixed assets when compiling the balance, some of these are as follows:

- **balance value** is the estimated value of stocks of fixed assets as recorded in the balance sheets of the enterprises. When revaluation of fixed assets is carried out it may happen that part of the enterprises' assets are recorded at current replacement cost in the business accounts and the assets

acquired in the period following it are valued at historic cost (price of acquisition). In that case the balance value represents a mixed estimate of the value of fixed assets;

- **historic cost** represents the actual cost of construction of buildings and of acquisition, delivery and installation of machinery and equipment and other types of fixed assets at prices available at the time of construction or at the moment the fixed assets are acquired. Full historic value is the actual value at which the fixed assets are put into operation and does not change until revaluation of fixed assets is carried out to estimate the assets at current replacement cost. Depreciated historic value is the value after deductions for consumption of fixed capital;

- **replacement cost** is estimated as a result of revaluation procedures by using different price indices, such as contract prices for construction work, wholesale prices of construction materials, fuel, energy, machinery and equipment, price indices of transport tariffs, etc. The replacement value could be also full and depreciated;

- **average annual value of stock of fixed assets** is the average value of fixed assets available during the year which is calculated as a chronological average.

The balance of fixed assets is compiled for "pure" industrial branches, that is to say, for example, that the value of fixed assets in transportation industry includes also the value of fixed assets of transportation units which represent a secondary activity to a unit classified in a different industry (such as trade).

Book-keeping and statistical reports of economic units are the main sources of data for compiling the balance of fixed assets. Some sample surveys which cover the assets owned by households are also used. Statistical reports are usually differentiated by type of units. In the Russian Federation they are different for business companies, small enterprises, budget organisations, joint ventures, institutions which report only during revaluation procedures (farms, banks) and households.

Annual statistical surveys

The estimates of stock of fixed assets are annually updated on the basis of the regular statistical information collected for that purpose. An annual statistical survey of available fixed assets and the change in their value is conducted for all enterprises which report data as recorded in their balance sheets. In most CIS countries these surveys are still exhaustive. Information for the following type of assets is collected: other buildings; residential buildings; machinery and equipment, transport equipment; and others. For each type of assets the enterprises report information on:

- value of stocks of fixed assets at the beginning of the year;
- acquisitions during the year (including new assets);
- withdrawals (including liquidation) of fixed assets;
- value of stocks of fixed assets at the end of the year.

The value of fixed assets owned by households includes the value of

individual dwellings and the value of breeding and dairy livestock, perennial plants, agricultural buildings and structures. In the **Russian Federation** their value is estimated annually on the basis of information taken from the household budget survey (HBS). However, the estimates are considered to be incomplete. Additional working tables are constructed by type of fixed assets on the basis of which a balance of fixed assets for households is compiled at full and at depreciated value.

The regular statistical collection in **the Kyrgyz Republic** covers all institutional sectors except households, for which additional estimation of value of dwellings and cultivated assets is made. Thus, for example, the value of dwellings is estimated by multiplying the area of dwellings by the price of 1 sq.m.; the value of fruit-bearing plants is estimated on the basis of information about total output of fruit and corresponding market prices; the value of livestock is estimated on the basis of number of animals and prices per head.

An exhaustive annual survey of all enterprises, budget organisations, co-operatives and small enterprises provides data for the compilation of balance of fixed assets in **Ukraine**; the last survey was conducted in 1996. In **Uzbekistan** the annual survey of major fixed assets covers all legal units except budget institutions. The last statistical survey of enterprises in **Belarus** was conducted in 1995.

Kazakhstan is still using the old classification of fixed assets adopted in 1987, according to which fixed assets are subdivided into 12 groups including buildings, structures, machinery, transportation vehicles and cultivated assets, but which also includes capital investments on improvement of land (irrigation systems, drainage systems, etc). For each classification group information is collected about the value of stock of fixed assets and the change in its value. Another classification differentiates the assets depending on how they are used, i.e. in stock, in operation, in reserve, rented. The classification is necessary because of the different rates of depreciation which are applied.

D. Revaluation procedures

In periods of high inflation revaluations of the value of fixed assets are carried out in order to adjust the value for high inflation. Usually the revaluation is obligatory for all enterprises as it is mainly carried out for tax purposes. The enterprises revalue the assets as recorded in their business accounts directly into current market prices or with the help of average coefficients centrally developed by the statistical agency. The results of the revaluation are then reported to the statistical agencies. The same data are also used in business accounts of the enterprises.

Revaluation of the value of fixed assets is usually established in law, by an Act approved by the government with an decree. The statistical offices are executing agencies in all countries which have experience with conducting regular revaluation procedures. Other institutions such as Ministry of Finance and Ministry of Economics might also be involved.

In **Poland** for example, the Ministry of Finance can issue a special order which sets up the terms of the revaluation, its scope and at what price levels. Such revaluations are carried out each year starting, with 1990 (except 1992), on 1 of January at prices of September of the previous year. The normal practice is that price indices by type of assets are used. When market prices for certain type of assets are available, they are used instead of the price indices. In revaluing the assets the following model is applied: the value of fixed assets at the beginning of the year is revalued at prices of the previous year, then the value of new fixed assets is added (taken from the investment survey) and the value of liquidated fixed assets deducted.

Only one revaluation of fixed assets was carried out in **Estonia** - on 1 January 1993 - which covered mainly the public enterprises. A general problem of the revaluation was that the bulk of fixed assets held by enterprises was not revalued.

At the beginning of the 90's **Latvia** experienced high inflation, PPI went up by 2600 % and CPI up by 1000%. Thus the value of fixed assets recorded in the accounting balance sheets of enterprises more and more did not correspond to their real value. The Council of Ministers decided that fixed assets should be revalued on 1 January 1992 in all enterprises and organisations, excluding agricultural enterprises and business companies with foreign participation. Revaluation coefficients were determined depending on the year of acquisition of fixed assets. Fixed assets in institutions financed from central and local government budget had to be also revalued, but as of 1 May 1992. As a result of the general revaluation, the value of fixed assets was increased on average by 2.5 times.

Latvia conducted a second revaluation of fixed assets for all units the next year (1993). The assets recorded in the enterprises' balance sheets before 31 December 1990 were revalued by a coefficient of 10 (i.e. the balance sheet value was increased by 10 times), those recorded between 1 January and 31 December 1991 - by a coefficient of 3 and fixed assets acquired in 1992 were not revalued. As a result of this revaluation the value of stock of fixed assets was increased by 6.6 times on the average.

From 1991 to 1993, in stages, revaluation of the fixed assets was conducted for the enterprises of the public sector, except agriculture, in **Bulgaria**, but the results are not considered satisfactory and are not reflected in the national accounts estimates.

The experience of CIS countries

In the **Russian Federation**, revaluations were carried out starting with July 1992 (excluding 1994), the last one being on 1 January 1997. In 1992, the replacement value of stock of fixed capital was reported to be 18.7 times higher than historic cost (balance value) of fixed capital while on 1 January 1996 only 2.6 times. The revaluation of fixed assets is done by industrial branches, sub-branches of manufacturing, forms of ownership, major type of fixed assets and territorial breakdown.

The revaluation of fixed assets in 1996 is characterised by two things.

First, two estimates of revalued capital stock were made and compared - statistical estimation on macro level and a detailed one based on the revaluation calculations reported by enterprises. The discrepancy between both was 5% which was seen by the Russian experts as a proof for the reliability and feasibility of the statistical estimation made on macro level. Second, enterprises are using more and more the evaluation experience of "independent" experts and agents rather than simply applying the centrally developed revaluation coefficients by type of assets.

There are still problems with the price indices used for revaluing the stock of fixed capital. More differentiated indices are needed, which also take into account the prices of imported goods. Unresolved problems with price indices have accumulatively distorted the value of stock of fixed assets with each revaluation process. The only solution to that, as seen by some Russian experts, is the direct observation of the stock of fixed capital which will show the degree of distortion in the estimates.

Revaluation of fixed assets in **Kazakhstan** was first conducted on 1 of January 1993, and since then every year according to a government decision. The revaluation by type of assets is done with coefficients determined on the basis of the average wholesale price indices of manufacturing industry and price indices of construction. Imported machinery and equipment is indexed by coefficients calculated as weighted averages of manufacturing price indices of Kazakhstan and CIS member countries. Price indices of sales of agricultural goods are used to revalue the fruit-bearing plants and breeding and dairy livestock. The stock of fixed assets held by households is generally not revalued. However, the stock of fixed assets of small enterprises registered by households is revalued.

Privatisation of dwellings started in 1990 in Kazakhstan and was done either at depreciated historic cost or free in charge. Practically all dwellings were privatised by the time of the first revaluation exercise in 1993, so the value of dwellings and unfinished construction were revalued by coefficient "1". The rest of the fixed assets were revalued by appropriate coefficients depending on the time of their acquisition.

Privatised enterprises used differentiated coefficients depending on the period they were privatised. According to the regulations, the value of stock of fixed assets of enterprises set for privatisation was estimated (revalued) on the date of their privatisation applying the monthly PPI. The privatisation process affected the ratio historic cost to current replacement cost. Thus, for example, during the first revaluation the value of stock of fixed assets was increased by 17 times and on 1 January 1995 only by 9 times.

The normal practice was that the value of old fixed assets is indexed by a higher coefficient. However, in several cases the replacement value happened to be higher than the current market value of new analogous assets, the most typical examples were hardware and cars. As a result of this, enterprises have been allowed to directly recalculate the value of their assets according to the current market prices at the time of revaluation process since 1995. However, enterprises have to present a proof of the estimate which can be in the form of an expert estimation or a certificate issued by the appropriate agency.

All legal entities are obliged to participate in the revaluation process. Good co-operation with tax authorities is established to insure that all legal units conduct the revaluation. Thus, for example, tax authorities will not accept the balance sheets of those enterprises which can not present a document from the statistical agency that the indexation has been done. Nevertheless, the ratio between those which did the revaluation of fixed assets and those which did not was still about 50/50 in 1995.

In the Kyrgyz Republic the first revaluation was carried out in 1993. However, during this first exercise, the coefficients as determined mainly in Russian Federation on 1 July 1992 were used. As a result of this revaluation the total value of stock of fixed assets was increased by 16 times (the previous revaluation was carried out in 1982). The CPI increased by 12 times in 1993 to 1992 (9 times in 1992/ 1991). In addition, it should be mentioned that the value of dwellings was not revalued. The second revaluation of fixed assets was carried out in 1996 but the results are not yet reflected into the balance of fixed assets for 1995.

The value of stock of fixed assets of public and private legal units have been revalued three times since December 1993 in **Moldova**. The assets were first revalued from roubles into the national currency - lei. Thus, for example, all assets acquired before 29 November 1993 were recalculated from roubles into lei by a factor of 1000. The value of assets acquired after 29 November were taken at their historic cost.

The revaluation of other buildings and structures is done by industries and the coefficients used are differentiated depending on the year the asset is put into operation. As in Kazakstan, enterprises are obliged to prove to tax authorities that they have done the revaluation of their assets. In case the value of a certain revalued asset (applying the coefficients) is more than 10% higher than the market price of similar assets, the enterprises are allowed to apply directly the market price, but they have to have a prove for that.

Revaluations of fixed assets have been conducted 3 times in **Uzbekistan**, on 1 April 1992, 1993 and 1995. All units, both private and public, were covered. Coefficients were developed differentiated by type of assets and by degree of wear and tear. The coefficients are determined on the basis of price indices of construction materials, machinery and equipment, as well as transport tariffs and the increase of the wages and salaries for the period January 1991-January 1995. Dwellings were not revalued.

Ukraine has been conducting regular revaluations of fixed assets since 1992. During the revaluations of 1995 and 1996 dwellings were also revalued (but not during the previous ones). The balance value of fixed assets as recorded in the enterprises' business accounts are revalued by the average price indices of construction works and of manufacturing. Revaluation of livestock is done on the basis of data about the weight of livestock and average prices of sales by type of livestock.

E. Industries and institutional sectors covered

Countries were asked whether estimates of stock of fixed assets were

available by industries and by institutional sectors. The practice, as reported, seems to be different from country to country.

Industries

In general, all countries produce estimates of stock of fixed assets by industries. However, countries from Central and Eastern Europe reported that changes in the economic classifications disturb the time series of fixed assets by industries. Some countries moved to the NACE Rev.1 in 1992 (Romania, Poland, Czech Republic), others in 1993 (Slovak Republic) and 1994 (Slovenia), a third group of countries is either in a process of implementing NACE Rev.1 (Bulgaria) or are planning to do so in the near future. Countries such as Lithuania started producing estimates by industry only from 1994, before that only estimates by type of assets were available. All CIS countries are still using the old industrial classification (though with some improvements) used in the material product system, so that eventual problems with disturbances in the time series are left for the future.

One problem, mentioned by several countries, is the coverage of those industries where small enterprises started dominating during the transition period. Thus, for example, the value of stock of fixed assets in industries such as trade, transport and agriculture could be underestimated due to lack of information on small businesses which are not registered and, as a result, not observed. The estimation of the stock of fixed assets in agriculture in several countries is reported to be far from complete because of lack of information on households.

Institutional sectors

All institutional sectors are covered in Bulgaria, Estonia, Slovenia, Poland (from 1995) and the Baltic states. However, in Estonia the estimation of capital stock is far from complete in household sector and NPISH.

Hungary, Romania and Slovak Republic have not estimated the value of fixed assets for household sector and NPISH. No estimation by institutional sectors is done in the Czech Republic, although this is planned for the 1997 estimates.

The CIS countries which provided answers to the survey produce estimates by institutional sectors. The annual balance of fixed assets is compiled by industries (the old industrial classification) and by form of ownership of legal units, but not by institutional sectors. The usual practice is that the industries are regrouped in order to form the institutional sectors. Only the Russian Federation explicitly reported that both public and private non-financial and financial corporations are covered. The Kyrgyz Republic does not estimate the value of fixed assets for household sector.

F. Differentiation of fixed assets from other assets

It seems that differentiation of fixed assets from other assets (e.g. buildings from land) does not represent any particular problem for most of the transition countries. In principle there are no problems with the

separation of value of land from the value of buildings and other structures built on it. Slovak experts are not able to distinguish the value of dwellings within other buildings and structures, but this affects mainly the value of fixed assets by type.

Usually the individual items of fixed assets are well defined, which helps their delineation from other assets. In some CIS countries, the enterprises are asked to report the value of land they own separately from the value of produced fixed assets. However, it should be noted that until recently sales of land were prohibited by law in those countries. If there is any market for land it has emerged only recently, so these transactions are not very common despite changes in legislation. In the Ukraine, for example, the value of land has not been collected and recorded so far.

There are some methodological and practical problems with differentiation of fixed assets from other assets, such as inventories, work-in-progress. In such cases differentiation is based on expert estimation.

G. Intangible fixed assets and sources of data for them

The 1993 SNA specifies that the value of intangible fixed assets, such as mineral exploration, computer software and literary and artistic originals, should also be included in the value of stocks of fixed assets.

It should be noted that new business accounts introduced recently in some transition countries incorporate data on intangible assets, both produced and non-produced, such as patents, licences, leases, trade marks, software, etc. Thus, for example, recent regulations in the Russian Federation clearly define the scope of these assets and the rules for their depreciation. In principle intangible assets are included in the classification of fixed assets of the Russian Federation and should be reported by enterprises. However, in practice enterprises very often have problems with the estimation of their value.

Belarus, Ukraine and Uzbekistan collect information on intangible assets through the annual statistical survey of fixed assets. In Ukraine, the value of software is taken from the questionnaire reported by all computing centres which act as separate enterprises or are part of others; expenditures on mineral exploration are estimated on the basis of information taken from the enterprises which carry out geological and drilling works and included in the value of gross fixed capital formation. Information on intangible assets held by small enterprises and co-operatives is taken from their reports.

No estimates of the value of artistic and literary originals have been made yet by any of the CIS countries. Estimates of intangible assets are not available at all in Kazakstan and Kyrgyzstan, although there are plans to make some estimates for 1996.

Intangible assets are recorded in the Czech enterprise accounting. The expenditures incurred on research and development are also part of the intangible fixed assets and reported by the enterprises. Data on acquisition

and disposal of intangible assets are recorded at historic cost. However, specific price indices for their revaluation at current replacement cost are not available.

The rest of the countries from Central and Eastern Europe and the Baltic states also include estimates of the value of produced intangible assets. The only exception is Romania, which reported that estimates of intangibles had not been produced yet. Hungary started collecting data in 1995. From 1993, Estonia includes the value of expenditures on mineral exploration. Annual statistical surveys on investments are the sources of data in Poland and Hungary. Slovenia and Slovak Republic derive the estimates from business accounts of the enterprises.

III. Methods used for estimating consumption of fixed capital

A. Depreciation or consumption of fixed capital. Gross or net values?

Countries were asked to describe the approach they apply in estimating consumption of fixed capital: depreciation at historic cost as used in the business accounts of enterprises or the concept of consumption of fixed capital at current replacement cost as defined by the System.

In principle, capital consumption should be calculated for all fixed assets - that is tangible and intangible assets - owned by producers, but not for valuables. It must be also calculated in respect of fixed assets which are constructed to improve land, such as drainage systems and dykes as well as roads, railway tracks, tunnels, dams, etc. The 1993 SNA recommends that consumption of fixed capital should be calculated taking account of the actual service lives of the assets concerned and be valued at current replacement cost. However, as already noted earlier, countries reported that very little information on the service lives of fixed assets is available, which makes the introduction of new methods extremely difficult. The exceptions are the Czech Republic and Slovenia.

Data available in business accounts of enterprises in transition countries refer to the concept of depreciation made on the basis of the historic value of fixed assets (price of acquisition). As the rate of inflation increases the historic costs of fixed assets may become quite irrelevant and the book-keeping values of depreciation become increasingly inappropriate as measures of consumption of fixed capital. For this reason some experts suggest that during the transition period it might be advantageous to focus on the gross estimates. Thus, for example, consumption of fixed capital is not calculated in Romania and Hungary (suspended in 1991) and the national aggregates are expressed only in gross values.

It should be noted in this context, however, that estimation of domestic product on a gross basis does not eliminate the need for estimation of consumption of fixed capital in the general government sector, as output of non-market services by government is normally measured at cost, i.e. including consumption of fixed capital.

B. Calculation of consumption of fixed capital

At present the concept of consumption of fixed capital at current replacement cost as defined by the 1993 SNA is applied by the Czech Republic and Slovenia. In the **Czech Republic**, it is applied to the two major types of assets, i.e. other buildings and structures and machinery and equipment. The concept of depreciation at historic cost is used for the remaining type of fixed assets. Consumption of fixed capital is calculated at the 2-digit level of NACE Rev.1 using information on gross fixed capital formation and average service lives of fixed assets. In addition, the information collected through the annual survey of the average age of demolished fixed assets has been reflected in the capital consumption estimates for 1995. It is possible that retrospective adjustments of consumption of fixed capital could be done for 1991-1994.

In Slovenia, enterprises decide for themselves about the depreciation function they apply (straight-line depreciation, declining balance depreciation), annual depreciation rates and the distribution of annual allowances over the years. Under conditions of high inflation data on depreciation has to be revalued. This revaluation is done using a retail price index, which covers the period from the moment the fixed asset was put into operation to the end of the estimation period. Depreciation rates as recommended for tax purposes differ from those applied in calculating consumption of fixed capital. According to the income tax law, depreciation allowances estimated by enterprises can not be higher than the value estimated by using the straight-line depreciation method and the highest rates as prescribed by the law. Thus, for example in Slovenia, they are: construction - 10%; equipment, vehicles - 33,3%; computers - 50 %; perennial crops - 14,3%; breeding stock - 50%.

The concept of depreciation

The concept of depreciation at historic cost of fixed assets (price of acquisition) as used in the business accounts of enterprises with some adjustments for high inflation is used by several countries (Poland, Slovak Republik, The FYR Macedonia, Yugoslavia). Again, the 1993 SNA says that if data on depreciation are used they must, at the very least, be adjusted from historic costs to current prices.

A third approach used by the countries is the **"best proxy" method**. It is applied by most countries, mainly those which experienced quite high rates of inflation during the transition period, such as the CIS countries and Bulgaria. As the rate of inflation increases, the book-keeping values of depreciation become increasingly inappropriate as measures of consumption of fixed capital. At the same time, information and conditions for applying better techniques (PIM or others) are not available, including information on length of service lives of fixed assets.

The usual practice is to take the ratios of consumption of fixed capital either to value added or to output over a certain period of pre-transition years as proxy measures of the amount to be attributed to consumption of fixed capital in later years. The general rule is that the period should be characterised by very low rates of inflation or practically

none, which was the case in most transition countries before the political and economic changes took place. Some countries take a longer period of ten years, e.g. Bulgaria, but others such as the CIS countries can take a very short one comprising of only two-three years. Where possible these ratios are calculated separately by branches and sub-branches of the economy (the old industrial classification still in use in most transition countries) and by different kind of fixed assets.

Since 1991 each reporting unit in **Bulgaria** has been free to determine the level of depreciation independently. However, the data available in the business accounts of enterprises refer to the concept of depreciation made on the basis of the historic value of fixed assets. Though revaluation of fixed assets was conducted for the enterprises of the public sector in several stages, the results are not considered as satisfactory and are not used for calculation of consumption of fixed capital in the national accounts. Until better estimates could be done using new information on the valuation of assets and perpetual inventory techniques, the ratios of consumption of fixed capital to value added over the period 1980-1990 are taken as proxy measures of the amount to be attributed to consumption of fixed capital in later years. The ratios over ten year period are calculated separately by branches and sub-branches of the economy and by different kind of fixed assets; the change in the kind of assets is also taken into account.

Similarly to Bulgaria, **The Kyrgyz Republic** has twice conducted revaluation of fixed assets but the value of stock is considered to be underestimated. So consumption of fixed capital is estimated as the average of the ratios of consumption of fixed capital to the value of output over the period 1990-1991. The same approach is applied by **Belarus and Uzbekistan**, but the ratios are taken over the period 1989-1990.

Consumption of fixed capital is calculated in parallel with the revaluation of fixed assets in **Moldova**. In **Ukraine**, depreciation data are adjusted from historic costs to current prices by using price indices of construction works (for buildings and structures) and wholesale price indices of manufacturing (for machinery and equipment).

From 1 of January 1997 enterprises in **Kazakstan** can chose one of the three possible methods for making depreciation allowances: straight-line depreciation; production method, (i.e. in proportion to the output) or accelerated depreciation. Different methods can be applied to different types of assets. However, only one method can be used for the same type of assets.

The experience of Russian Federation

Earlier in this paper it was noted that data on consumption of fixed capital appear in the balance of fixed assets compiled by the CIS countries. The balance value (mixed value) of fixed assets, as reflected in the balance of fixed assets is the basis, for estimating the consumption of fixed capital in the **Russian Federation**. In principle, the balance value is the closest estimate to the concept of current replacement value of fixed assets; it is calculated as an average annual value of stock of fixed assets (i.e. the value of stock after last revaluation and the value of acquired and

liquidated fixed assets during the accounting period at current prices). Depreciation rates by type of assets are then used to calculate consumption of fixed capital. During periods of high inflation consumption of fixed capital is broken down in quarters, and then inflated by the price index of capital investments for the corresponding months.

Since 1 January 1997 the rules for making depreciation allowances and the annual rates of depreciation have been changed in the Russian Federation. The stocks of fixed assets are sub-divided into four categories, for which corresponding norms of depreciation are determined instead of the existing 1.5 thousand. Thus, for example, 5% will be the norm for buildings and structures; 25% for cars, light trucks, office equipment, hardware ; 15% for technological, electrical and transport equipment not included in the previous two groups. The same norms to be used by small enterprises and individual entrepreneurs are respectively 6%, 30%, 18%. The depreciation allowances for intangible assets will be made by applying equal proportions in the course of their service life. In those cases where service lives of intangible assets can not be defined they are fixed to 10 years.

C. Coverage by institutional sectors

Generally, consumption of fixed capital is calculated for all institutional sectors. There are no problems in its calculation for the non-financial and financial corporation sectors. The information is usually taken from reports provided annually or even quarterly by the enterprises to the statistical agencies.

The estimates for general government sector are in most cases compiled using information on the value of fixed capital at current replacement cost and fixed rates of depreciation by type of assets. An alternative method applies previous year ratios of consumption of fixed capital.

Not all countries calculate consumption of fixed capital for the household sector and NPISH. The main reason is the lack of information on the value of stock in these two institutional sectors and especially for the households. Information on stock of fixed assets used by households for production is either not available or far from complete in both Central and Eastern Europe and CIS countries. Another problem is the lack of appropriate price indices to adjust the estimates for high inflation.

Some countries calculate consumption of fixed capital for the household sector on the basis of information taken from income declarations reported to the tax authorities. Depreciation rates are cross-checked and harmonised with the rates applied to fixed assets in similar economic activities exercised by non-financial corporations.

In the **Slovak Republic** for example, tax returns do not show separately data about depreciation allowances and depreciation is estimated on the basis of information taken from different sources. Thus, for example, the structure of acquired tangible fixed assets is taken from a statistical sample survey (buildings and structures, machines and equipment, others). An attachment to the income declarations gives information on the average value of stock of fixed assets. Tax payers may apply either declining balance

depreciation or accelerated depreciation and the mode of depreciation, determined by the owner for every newly acquired tangible or intangible fixed asset, is then fixed throughout the depreciation period.

Calculation of consumption of fixed capital for the private household farms pose problems in a number of countries, mainly because of lack of information on the stock of fixed assets. In **Slovenia**, for example, as information on stock of fixed assets in private farms is not available, consumption of fixed capital is estimated by using proxy measures. It is estimated to 15% of the value added; for the non-agricultural part of the household production this proportion is 13%.

D. Consumption of fixed capital at constant prices

Some countries estimate consumption of fixed capital at constant prices (mainly CIS countries) others do not (Bulgaria, Slovak Republic, Baltic states, Yugoslavia). The Czech Republic does not make estimates at constant prices, but it does not represent any problem to do it.

Hungary and Poland calculate constant price estimates from constant price values of fixed assets. Price indices are used by the CIS countries which vary across the countries. In Belarus, this is the price deflator of gross fixed capital formation; in the Russian Federation constant price estimates are obtained with the help of price indices of the major types of fixed assets and price index of construction work; Ukraine deflates the current values of consumption of fixed capital by the output price deflator of those branches which produce predominantly fixed assets. Kyrgyzstan uses extrapolation of current values by volume indices of the corresponding economic branches.

IV. Gross fixed capital formation (GFCF)

A. Length of time series on GFCF at current and at constant prices

All transition countries have long traditions in estimating the value of gross fixed capital formation both at current and constant prices. The series go back to the beginning of the 50s, in the Russian Federation to 1960. However, it has to be made clear that these figures refer to the old system, the Material Product System (MPS), the methodology used by all centrally planned economies. For most countries gross fixed capital formation as defined by the 1993 SNA has been estimated since the beginning of the 90s.

The series for most **CIS countries** start around 1990 when the Former USSR was dissolved. The Russian Federation and Ukraine have estimates from 1989; estimates at both current and constant prices are available for the period 1989/90 - 1995. In most cases the constant price estimates are expressed at prices of the previous year. The reason for this is that because of the big structural changes which took place in these countries and high levels of inflation experienced in all countries it was thought appropriate to make constant price estimates at prices of the previous year.

The length of time series in the countries of **Central and Eastern Europe and the Baltic states** is the same or even shorter. Thus, for example, the series of annual estimates of GFCF at current prices start from 1991 in Bulgaria, Hungary, Poland, Slovenia and Lithuania. Romania starts the series from 1989 and Yugoslavia from 1990. Annual estimates at current prices for the Czech Republic and Slovak Republic are available only from 1992, but quarterly estimates of GFCF at current and constant prices are available from 1987 for Czech Republic and from 1990 for the Slovak Republic (only aggregated data) . The shortest time series is available for Estonia, starting in 1993. Lithuania is planning to start producing estimates at constant prices only in 1998.

B. Disaggregation of gross fixed capital formation

Gross fixed capital formation in CEE countries and the Baltic states is disaggregated by type of assets, by industry and by institutional sector. In FYR Macedonia, it is done by type of assets and by industry.

However, disaggregation by type of assets could be different for different institutional sectors. Thus, for example, in **Slovak Republic** only two types of assets are distinguished for non-financial corporations sector - buildings and structures and other tangible and intangible fixed assets. For the government sector, the following type of assets can be identified: R&D, software, other intangible assets, buildings and structures, machinery and equipment, of which transport, office equipment, etc.

Another cross-classification is between industries and institutional sectors. Thus, **Slovenia** mentions that gross fixed capital formation in agriculture is allocated to different institutional sectors - non-financial corporations and households. This is done on the basis of financial data taken from the banks reports, i.e. bank credits given to enterprises and individual farmers.

As regards the **CIS countries**, disaggregation by type of assets, industry and partially institutional sector (households) is available only for the Russian Federation. The rest of the CIS countries disaggregate GFCF by industry and by institutional sectors but not by type of assets. Gross fixed capital formation is calculated by industries which are then regrouped by institutional sectors. In Uzbekistan, it is first calculated for the whole economy and then disaggregated by institutional sectors.

C. Methods of measuring

Basically, the measurement of gross fixed capital formation follows the principles of the 1993 SNA. The main exceptions refer to countries which have not implemented the main framework of the system of national accounts yet. There are some problems with the full coverage of gross fixed capital formation as reported by the countries.

The 1993 SNA defines gross fixed capital formation of an institutional unit or sector as measured by the value of the acquisitions less disposals of new or existing fixed assets. However, for the economy as a whole the acquisitions less disposals off-set each other and total gross fixed capital

formation is thus a measure of new fixed assets. The 1993 SNA also defines the main types of gross fixed capital formation which are distinguished in the System: tangible fixed assets; intangible fixed assets; major improvements to tangible non-produced assets, including land; costs associated with the transfers of ownership of non-produced assets (e.g. land).

Gross fixed capital formation also includes construction of military facilities that can be converted to civilian uses, such as roads, hospitals, etc. The 1993 has expanded the scope of GFCF to include capital outlays on intangible assets. These cover capitalised outlays on mineral exploration, acquisition of software and output of artistic and literary work. Only unfinished construction in respect of which a change of ownership has taken place is included in the GFCF.

Generally, countries measure the gross fixed capital formation by the value of the expenditures (capital investments) made for tangible and intangible fixed assets. Tangible fixed assets include dwellings (rented and owner-occupied); other buildings and structures; machinery and equipment, including transport equipment; expenditure on planting fruit-bearing plants; purchases of breeding and dairy livestock. In most cases, intangible assets include computer software and the products as a result of scientific work.

Gross fixed capital formation also includes expenditures made by households on own-account construction of dwellings and major repairs; these are estimated on the basis of construction statistics data and data from household budget surveys. A special note is made by Romania, which included an estimate of gross fixed capital formation for the hidden economy - this is the value of construction work carried out by private workers in building new dwellings or renovating the old ones (since 1991).

In their answers, countries explicitly mention that they follow the 1993 SNA recommendation to treat the acquisition of military equipment as intermediate consumption of general government.

Several countries noted that no information is available on acquisition of fixed assets by small private enterprises. In Bulgaria, for example, these are the small enterprises that are not required to keep double-entry book-keeping and are mainly classified to household sector. In Slovenia, estimates of gross fixed capital formation for private enterprises have been included since 1992. The amount of capital formation by small or unincorporated enterprises is still relatively small in some CIS countries where the privatization process has not finished yet. However, it is very likely that the share might grow in future.

Three countries, namely Bulgaria, Check Republic and Romania, split each component of gross fixed capital formation by products for the purpose of compiling the annual input-output tables.

CIS countries

The CIS countries follow a similar methodology, recommended by the CIS Statistical Committee. Gross fixed capital formation is measured on the

basis of capital investments made as reported by the enterprises. A second method uses annual data reported by enterprises about the value of their new assets put into operation and the value of those which have been scrapped, data which are also used for the compilation of the traditional balance of fixed assets.

The value of gross fixed capital formation includes the value of capital investments made for:

- acquisition of new fixed assets (buildings, structures, machinery and equipment, transport equipment) which are valued at purchasers' prices, including the expenses incurred for ownership transfer, transportation, taxes and agents' fees; own-account production is valued at cost; the value of major repairs that significantly change characteristics of capital goods is also included,
- geological and drilling works related to specific construction sites;
- capital goods and services incorporated into the land to improve it or prepare it for productive use (clearing, draining, etc.);
- unfinished construction in respect of which a change of ownership has taken place (paid for by the contractor).

Gross fixed capital formation includes also: acquisition of imported equipment bought at credit; changes in breeding and dairy livestock; purchases of equipment by budgetary government units; purchases of books for libraries; expenditures on mineral exploration not related to construction (information collected from specialised enterprises); development and acquisition of software, including databases; expenditures on the acquisition of literary and art originals; costs associated with transfers of ownership of non-produced assets

D. Intangible fixed assets

Hungary and Romania do not include any estimates of intangible fixed assets in the value of gross fixed capital formation. Bulgaria and Slovenia have included the value of purchases of software since 1994 and the Slovak Republic since 1992. The Baltic states have also included the acquisition of intangible assets.

Several countries mention problems with distinguishing the value of software from the value of hardware. According to the accounting rules in one country, enterprises report the value of software separately only if it has been purchased as an individual item or developed by the enterprise itself. Usually the purchases of software are reported under tangible fixed assets together with the value of hardware. This affects the structure of fixed assets but not the value of gross fixed capital formation as a whole. However, it might affect the value of consumption of fixed capital.

Financial leasing was mentioned by Hungary and the Baltic states. The 1993 SNA (paragraph 10.44) says that a financial lease is a contract between lessor and lessee whereby the lessor purchases the good and the lessee pays rentals which enable the lessor, over the period of the

contract to cover all costs including interest. The goods under a financial lease are treated in the System as if they were purchased by the user, that is, as if a change in ownership had occurred. Since 1991 Hungary has included in the gross fixed capital formation the difference between the value of imported capital goods under financial leasing and the rentals paid on them. The value of rentals is included in the intermediate consumption. From 1995, Estonia includes an estimate of financial leasing in the value of GFCF.

Most of the CIS countries include the value of software and mineral exploration in gross fixed capital formation. Only Kyrgyzstan mentions that an estimate of the value of artistic and literary originals is also included. In principle, countries are aware of the SNA recommendation that costs associated with ownership transfers of non-produced non-financial assets should be included in the gross fixed capital formation. However, the answers provided does not make it clear whether information is available and whether any problems are encountered by the countries.

E. Constant price estimates

In principle most transition countries which responded to the survey have estimates of gross fixed capital formation at constant prices, the only exception being Uzbekistan. The deflation is done by components of GFCF using the appropriate price indices. Most often these are the price index of investment goods, a capital investment index or a combination of price indices of machinery and equipment and construction price index.

The majority of transition countries produce constant price estimates at prices of the previous year. Some countries make estimates at fixed base year, such as Slovenia (1992), Latvia (1993), and Hungary (1992).

It should be noted, in the context of the constant price estimates, that the survey did not deal with the price indices used by the countries. In most countries the methodologies used for the calculation of price indices still differ from those internationally recommended, which affects the constant price estimates in general.

F. Sources of data

Usually several sources of data are used in order to estimate the value of GFCF with different sources used for compiling GFCF by industry and by institutional sectors (balance sheets, consolidated state budget, book-keeping reports of private NPIs). The statistical surveys conducted for the big non-financial corporations provide information on net acquisitions of tangible and intangible fixed assets. The Czech Republic has introduced a separate form to collect information on net acquisitions of land and other non-produced assets.

In most cases, in the estimation of an individual item of GFCF, a combination and mutual comparison of all available sources of data is made and data are cross-checked and compared. For this purpose, Bulgaria, the Czech Republic and Romania construct a sector-branch (industry) matrix which shows possible discrepancies between estimates by industries and by sectors.

The analysis of the matrix allows for certain adjustments to be made. A second adjustment is made by products through the input-output techniques when the supply and use tables are balanced. In Romania, for example, this is done simultaneously in current and constant prices.

The CIS countries collect information on net acquisitions of assets with the annual reports of construction and manufacturing enterprises. Other sources used are: financial statistics, state budget and household budget survey for the households.

Countries noted that they have problems with collecting information on: major improvements to non-produced non-financial assets; the value of costs of ownership transfers (Czech Republic and Romania); financial leasing.

V. Specific problems of transition and their effect on the estimation of capital stock and consumption of fixed capital.

A. High rates of inflation

High rates of inflation are experienced by transition countries as a major problem in the measurement of capital stock for the moment. Countries are trying to deal with it by conducting regular revaluations of fixed assets. However, some countries do not find the estimates satisfactory.

The estimation of value of capital stock and defining the concept of capital investments are still major problems for most statistical agencies of the CIS countries. There are methodological and practical (from organisational point of view) reasons. In some countries (Kyrgyz Republic, Uzbekistan) the survey of fixed assets is not conducted on a regular basis and the estimates at current replacement cost are very doubtful. Thus, for example in the Kyrgyz Republic, the stock of fixed assets is valued at prices of acquisition (historic cost). The only revaluation of fixed assets was carried out in 1993 and the results are not considered satisfactory. Consequently, for the period 1990 - 1995, the value of fixed assets at the end of the year, according to the balance of fixed assets (balance value) in mln. soms is moving as follows: 119 (1990); 170 (1992); 3344 (1993); 5247 (1994); 6666 (1995).

A major weakness, as seen by the Kyrgyz experts, is that capital consumption estimates derived from the balance of fixed assets differ from the concept of consumption of fixed capital as recommended by the 1993 SNA. Thus, for example, the value of consumption of fixed capital estimated on the basis of the balance of fixed assets for 1995 is 449 mln. soms while the estimate made based on the "best proxy" method (see the section on its calculation) is 1644 mln. soms. It is desirable that retrospective revaluation of stock of fixed assets is carried out in order to make adjustments for the high inflation. However, both methodological knowledge and lack of data prevent this work for the moment.

B. Privatisation

All transition countries have to reflect in their national accounts the privatisation of fixed assets which has taken place since the beginning of the transition period. This is recorded in the accounts as a property transfer between institutional sectors. State owned dwellings sold to households are treated as gross fixed capital formation increasing the value of gross fixed capital formation of household sector and decreasing the GFCF of government sector by the same amount.

Countries responded differently to the question of whether the privatisation procedures affected their estimates of capital stock. For Estonia, for example, the process of privatisation did not influence the level of gross fixed capital formation. The privatisation was carried out through vouchers and the privatised assets had to be revalued at their replacement cost both for the state and public sectors. For that purpose, detailed information on stock of fixed assets by type, appropriate price indices and information on the length of service lives was also needed.

Romania also experienced voucher privatisation; the largest part of it was done in 1996 when a large number of enterprises privatized up to 60% of their capital. In the Czech Republic, in view of the large scale of property transfers during the first and second waves of voucher privatization, the value of stock of fixed assets as recorded in the balance sheets of the enterprises was regarded as very rough. For accounting purposes fixed assets in privatised enterprises are recorded at estimated prices. The prevailing part of enterprises with 25 and more employees which are covered by the direct observation of age structure of capital stock, can provide information on the year of acquisition and price of acquisition.

The process of privatisation has been monitored by quarterly statistical surveys since 1992 in Ukraine. Information on the value of state fixed assets which are submitted for privatisation is collected with the same forms.

C. Other problems

A few other problems are mentioned by the countries. One of them is the considerable share of completely obsolete equipment which is still in use in the production process in most CIS countries. In general, the revaluations do not cover the housing stock. There are problems with the development of price indices for capital investments, investment goods and imported equipment.

The 1993 SNA states that capital consumption must be calculated in respect of fixed assets which are constructed to improve land (e.g drainage systems) or on assets which are constructed through land-roads, railway tracks, tunnels. Several countries noted that was a problem for them.

VI. Future work

Countries were asked about their plans for improving the estimation of capital stock and the calculation of the consumption of fixed capital.

Depending on the methods presently used different answers were received. They vary from work on improving the PIM techniques to simply planning, some time in the future, to produce an estimate of the value of stock of fixed assets.

In the Czech Republic, the work on developing "finer" price indices needed for the valuation of capital stock is envisaged to start in 1997. This will improve the estimation of capital stock and the calculation of consumption of fixed capital for two types of assets: other buildings and structures and machinery and equipment. The work on conducting direct periodic observation of age structure of capital stock will continue. At its initial stage is the preparatory work for evaluation of capital stock of cultivated assets. The same refers to the work on estimation of stock of dwellings.

Collecting data about service lives of fixed assets and developing suitable assumptions about the retirements of assets is planned for the future in Hungary. This is required in order to develop the vintage method into a PIM model. Another problem to be resolved is the collection of information on small enterprises and entrepreneurs. As already mentioned earlier, Hungary suspended the estimation of value of capital stock since 1991. The main reason that the suspension has lasted so long is that the rate of inflation is still high and the process of privatisation has not been completed yet.

Several countries noted that improving quality of basic statistics on capital stock is an important prerequisite in order to improve valuation of capital stock as well as estimation of consumption of capital. The methods used for the estimation the stocks of fixed capital are also important. Recommendations on how to do the best estimates during the transition period are needed.

The compilation of balance of fixed assets, used in the CIS countries, does not satisfy the SNA requirements. To reduce to a minimum the differences, some methodological problems have to be resolved. One of them is the coverage of gross fixed capital formation. The balance of fixed assets does not include data about: historical monuments; acquisition of fixed assets for military purposes, which can also be used by the public (computers, cars, etc.); the coverage of livestock is also not complete as recommended by the SNA. At the same time expenditures on major improvements of land and other non-produced tangible assets and expenditures on ownership transfers have to be taken out from the value of stock of fixed assets.

Practically all countries emphasise in their answers that some methodological assistance and consultations are required to improve the current methods or implement new ones for the estimation of value of capital stock. The majority of the CIS countries mention that detailed recommendations for applying the PIM technique will be very helpful as well as studying the experience of countries applying it. The organisation of training courses on measurement of capital stock could be very useful.