INSTITUTE OF SOCIAL STUDIES

Working Paper Series No. 256

THE SOCIAL ACCOUNTING MATRIX EXTENDED WITH SOCIAL AND ENVIRONMENTAL INDICATORS: AN APPLICATION TO BOLIVIA

J.V. Alarcón, J. van Heemst and N. de Jong

August 1997

Comments are welcome and should be addressed to the author:
c/o Publications Office - Institute of Social Studies - P.O. Box 29776
2502LT The Hague - The Netherlands

The Institute of Social Studies is Europe's longest-established centre of higher education and research in development studies. Post-graduate teaching programmes range from six-week diploma courses to the PhD programme. Research at the ISS is fundamental in the sense of laying a scientific basis for the formulation of appropriate development policies. The academic work of the Institute is disseminated in the form of books, journal articles, teaching texts, monographs and working papers. The Working Paper series provides a forum for work in progress which seeks to elicit comments and generate discussion. The series includes the research of staff and visiting fellows, and outstanding research papers by graduate students.

For a list of available Working Papers and how to order them see the back of this Working Paper.

For further information contact:
Publications Office - **Institute of Social Studies** - P.O. Box 29776
2502LT The Hague - The Netherlands - FAX: +31 70 4260799
e-mail **#publication_dept@iss.nl** (Attn: Publications Assistant)

Abstract

The main aim of this paper is to show that for monitoring and policy analysis purposes, social and environmental indicators must be nested into an accounting framework. In the present work the Social Accounting Matrix (SAM) framework is used, because of its flexibility, among other things regarding the inclusion of non-monetary data, such as social and environmental indicators. The main thrust of the paper is methodological. As until now experiences with the compilation of extended SAMs, in particular for developing countries, appear to be rather limited, the paper aims at adding to these experiences through the construction of an extended SAM for Bolivia for the year 1989.

The Social Accounting Matrix Extended with Social and Environmental Indicators: An Application to Bolivia

28 May 1997

J. V. Alarcón, J. van Heemst and N. de Jong
Institute of Social Studies - The Hague

1. Introduction

Since the publication of *Adjustment With a Human Face* (Cornia *et al.* 1987) among other things the adverse effects of structural adjustment programmes on the lower income segments of the population in many LDCs have received more attention. The need to assess their impacts has been voiced by international and national organizations alike. Likewise, increasing awareness of the deterioration of the environment and its longer term effects have become a constant preoccupation of Governments and international agencies. In some cases (e.g. WCED 1987) an argument has been made for the re-definition of development and the re-focusing of its objectives. In order to heed such calls, it is imperative that simultaneously to the efforts to develop ways and means to device social and environmental indicators, a consistent framework must be developed. It is in such a context that this paper should be interpreted. More concretely, this work is an attempt to respond to the need to include, explicitly and directly, the two sets of indicators into a system which accounts for their relations to the economic system and provides the basis for diagnoses and eventually for "informed" policy making.

Our starting premise is that there exists a strong relation between the development of accounting frameworks and the ability to formulate more appropriate macro policy strategies and scenarios. In spite of their limitations, accounting frameworks can play an important role in the process of analysis and policy formulation process, be this in relation to the economic, social or environmental realms, either separately or simultaneously.

The main aim of the paper is then to show that for monitoring and policy analysis purposes, indicators must be nested into an accounting framework. In the present work the SAM framework is used because it is flexible and consistent and maintains consistency when indicators, such as socioeconomic and environmental indicators, are introduced.

It is expected that the approach as adopted in this paper may contribute to a better understanding of the underlying relationships and also of the importance of accounting frameworks as synthesizing frameworks (compatible databases) and as a basis to identify the "accounting" relations between variables as well. These frameworks can at a later

stage be used as the basis for the construction of analytical models for policy formulation.[1]

Conventional national accounting systems have their limitations. Hence, the ensuing analysis is in turn limited and subdue. In order to overcome some of the limitations more comprehensive systems have been developed, among which the traditional and "extended" input-output (I-O) tables and their "generalized" form as Social Accounting Matrices (SAMs) are the most prominent. In this context, it should be mentioned that there is a general consensus about SAMs being more suitable to portray key aspects which characterize a country's socioeconomic structure, i.e. the production structure, the distributional aspects and how this relates to socioeconomic groups and other institutions. The advantage of using a SAM to incorporate both sets of indicators is that their interrelations can become more apparent and transparent.

As originally postulated, SAMs allow for the reformulation of a growth strategy in terms of the "elimination of absolute poverty within a limited time horizon" (Pyatt and Thorbecke 1976).[2] Clearly enough, this characteristic combined with its flexibility and comprehensiveness enables the evaluation of the effects of structural adjustment programmes (Adelman and Taylor 1990, Thorbecke 1992 and Fargeix and Sadoulet 1990, among others). It follows that taking advantage of the just mentioned characteristics, the proposed SAM "extensions" can be considered as the next logical step in the efforts to simultaneously account for the goods, the bads, the well-being and their interrelationships, which include the effects of the economic activity on the well-being and the environment.

The main thrust of the paper is methodological. As until now experiences with the compilation of extended SAMs, in particular for developing countries, appear to be rather limited, the paper aims at adding to these experiences through the construction of an extended SAM for Bolivia. Through this exercise issues related to data availability, data presentation, and, related to that, choice of format are being confronted. The 1989 SAM for Bolivia,[3] the fourth round of the integrated budget survey, and the 1992 census data and 1990 data on the environment have been taken as the basis for this exercise.

The paper is organized as follows. Section 2 starts with a brief discussion of the features of SAMs and SAM-based models and describes the aggregated SAM for Bolivia 1989. In

---

1 A detailed presentation about the relation between accounting frameworks and strategies can be found Alarcón (1990). Detail concerning SAM-based modelling can be found in Dervis, de Melo and Robinson (1982) and Taylor (1979, 1983 and 1990).

2 Streeten and Burki (1978) and Streeten (1995:18-19) postulate that the true objective is the eradication of absolute poverty or the promotion of human development, while income distribution and growth are "quasi-objectives" as they constitute necessary but not sufficient condition.

3 UDAPE (1990): "La Matriz de Contabilidad Social para la Evaluación de la Inversión Pública", La Paz 1990.

the third section the methodology to extend the money-metric SAM so as to include quantity-metric (physical) indicators of well-being and the environment is described. In Sections 4 and 5 two sets of indicators, one relating to housing, another one to emissions of pollutants, waste and depletion of natural resources, are presented as examples of illustrating the proposed methodology regarding well-being and the environment, respectively. In the last section some concluding remarks will be made.

2. The Social Accounting Matrix and SAM-based Models

In this section, first the main general characteristics of SAMs are briefly presented. This is followed by referring to the assumptions and implications of SAM-based modelling. Finally, the 1989 SAM for Bolivia - used as a basis for the illustration of the extensions - is described in its aggregate form.

2.1 The Social Accounting Matrix

SAMs follow the single entry principle and present a series of accounts laid out in a modular form as a matrix. For each account, row entries represent incomings/income, while column entries represent outgoings/expenditure in the accounting period. Expenditures of one account are booked as income of another and vice versa. Further, row and column totals must balance, i.e. total incomes equal total expenditures for each account. The fact that the information in a SAM combines economic and social characteristics makes the SAM an important tool in the process of integrating and consolidating corresponding information of an economic reality. SAMs integrate information which is provided by the national accounts, input-output matrices, censuses and surveys, plus data which is dispersed and/or comes from conventional or non-conventional sources.

The number of main accounts and their degree of disaggregation in sub-accounts is directly related to the objectives pursued and the amount and quality of the existing information. However, a small number of accounts and/or low degree of disaggregation can also be the result of convenience, practicality and a genuine interest to avoid unnecessary complexity.

Complaints of inaccuracy, inconsistency and unreliability of social or economic statistical data become more acute and commonplace when attempts are made to build a SAM. Although for the majority of cases complaints may be justified, inevitably there is always information which is fragmented and dispersed, and which ironically is often not used for lack of a rigorous and consistent accounting framework such as a SAM.

Briefly, the usefulness of a SAM can be attributed to four of its main objectives, some of which are common to other systems. In the first place, it must help to organize, coordinate and reconcile the information which comes from different sources. Second, it must be comprehensive and disaggregations and classifications must allow for the identification of structural (accounting) relations. Third, it must serve as a common base to the "producers" as well as the main "users" of SAMs. Finally, SAMs as a meso framework allow for the introduction of the "stylized facts" which are most relevant to the process of development,

e.g. through a limited number of accounts, and hence can serve as a system to monitor the process of socioeconomic development by allowing micro level effects up to a certain extent to be reflected at the macro level.

The importance of a SAM as accounting and conceptual framework results mainly from its flexibility and robustness. As suggested above, it allows for the explicit incorporation of a number of modules - those which may be considered most relevant. SAMs include as a minimum functional relations within the productive structure, the generation of factorial and personal income and the expenditures and consumption levels, while some SAMs in addition include modules that relate household consumption (by socioeconomic strata) with poverty or basic needs insatisfaction.[4] The strength of a SAM lies in its ability to depict distributional patterns, albeit in a fixed manner, and to include corresponding tools which allow for informed policy design and simulation.

Finally, the existence of a SAM facilitates the derivation of models - models which, as indicated above, can serve as a basis for socioeconomic analysis and (factual or counter-factual) policy simulation.[5] More importantly, modelling is done from a comprehensive perspective yielding by definition unique and feasible solutions (Taylor, 1983:46).

2.2 SAM-based Models

It stands to reason that to derive SAM-based models it is necessary to explicitly introduce assumptions about economic behaviour. In that respect, as SAMs are a generalization of input-output (I-O) models, it is convenient to refer to the "generalized" Leontief assumptions (Taylor 1983). A generalization of I-O models means that the sector concept - the column entries of the I-O matrix - must be generalized into outlays or expenditure accounts in a SAM, while the commodity concept - the I-O row entries - becomes the receipts or income of accounts, both for current and capital accounts.

For our purpose it should be sufficient to mention the most relevant assumptions, i.e those of linearity and fixed expenditure structure, idle capacity, constant returns to scale, etc. The assumptions are typical to demand models which are applicable only in the short-term (Alarcón et al. 1991). Finally, similarly to I-O models, or any type of model for that matter, SAM-based modelling requires that accounts be separated into endogenous and exogenous ones. For SAM-based modelling the criteria to separate accounts is partly the result of

---

4 See van Heemst (1991).

5 There many examples. Among the most interesting are Adelman and Taylor (1990), Bourguignon, Branson and de Melo (1989) and Fargeix and Sadoulet (1990).

design and partly of convention.

In spite of the fact that SAMs depict accounting relations, i.e. the relations which do not reflect behaviour in the strict sense, they nonetheless show explicitly the economic circular flow and suggest functionality, both of which can form the basis for the development of three types of models: (a) accounting multiplier, (b) fixed-price multiplier, and (c) computable general equilibrium (CGE). SAM-based CGEs are the most appealing because of their straightforward interpretation. In addition, they maintain flexibility and consistency, allowing for the introduction of production functions, fix-flex prices and distribution in a systematic manner, all of this within an equilibrium framework. CGEs adhere in general to the most strict modelling conditions,[6] a characteristic which no doubt constitutes an advantage when attempting to model aspects related to sustainability.

2.3 An Aggregated SAM for Bolivia 1989

Looking at Table 1 in which the aggregated SAM for Bolivia is presented, one can identify the economic circular flow, that is, the flow production ⇒ (factorial/personal) income ⇒ demand for goods and services ⇒ production.

The table shows in column 1 that productive activities (PA) *produce*/supply goods and services amounting to 27453.7 million Bolivianos.[7] To accomplish production, activities hire factors of production (FP); as compensation they pay *income* (generate value added) amounting to 14087.0. This figure appears in the transaction module, row 3, column 1.[8] *Incomes* which accrue to factors of production become transfers or *incomes* of institutions, i.e. indirect taxes payed to the government - included in other institutions (OI) - totalling 162.9 (OI-4,FP-3), household incomes 12512.6 (HH-5,FP-3) and payments of 1411.5 to the rest of the world (RW-7,FP-3). Income of other institutions translates itself into domestic *demand* by the government, amounting to 1619.9 (CM-2,OI-4), payments to the rest of the world 609.3 (RW-7,OI-4), transfers to households 244.7 (HH-5,OI-4) and savings, equal to 352.7 (KA-8,OI-4). For its part, household incomes translate into *demand* for necessities, purchases valued at 10140.5 (BN-6,HH-5), plus income or direct taxes to the amount of 859.9 (IO-4,HH-5) and savings of 1757.0 (KA-8,BN-5). *Total demand* is made up of intermediate demand for goods and services by the productive activities,

6 The list of CGE applications is very extensive. However, clear and to the point presentations can be found in Taylor (1979 and 1990) and Robinson (1989).

7 All figures are in millions of Bolivianos.

8 From here on we use the following symbology "account row number account-column number"

equivalent to 12093.1 (CM-2,PA-1), plus trade margins of 346.9 (CM-2,CM-2), government demand (consumption) of 1619.9 (CM-2,OI-4), household consumption 10140.5 as expressed in basic needs (CM-2,BN-6), exports 4732.7 (CM-2,RW-7) and gross capital formation 1695.2 (CM-2,KA-8). The sum is equal to total supply, that is 30628.3 (CM-2). The just mentioned total is divided into goods and services which are domestically produced, which amount to 27453.7 (PA-1,CM-2), plus those imported, amounting to 2665.4 (RW-7,CM-2), plus their corresponding trade and transport margins equal to 346.9, plus an amount of 162.3 paid as import duties (OI-4,CM-2). From the SAM it can be seen that exports (F.O.B.) plus payments by the rest of the world reached 5100.6, a value which is larger than the sum of imports, factor payments of 1411.5 to the rest of world (RW-7,FP-3) and income payments to the rest of the world, (RW-7,OI-4) valued at 609. Consequently, the country recorded a current account surplus, which constitutes an outflow of capital, amounting to 414.5 (CM-8,RW-7). As can clearly be seen, this depicts the circular flow of the Bolivian economy in 1989.

The just described circular economic flow, and the way the flows affect the different sub-accounts, can be seen in more detail in the disaggregated version of the Bolivian SAM which is presented in Appendix A.1.

3 The Extended Social Accounting Social Matrix and its Characteristics

3.1 The Need to Extend the SAM

A majority of countries face problems in terms of the environment. In addition, a number of developing countries face sustainability problems, reflected by high levels of basic needs insatisfaction and growing environmental problems. As most of those problems can be directly attributed to the structure of production and consumption, it would seem urgent and necessary to find ways to make explicit those problems within an accounting framework. In that context, we propose to extend a SAM to include social as well as environmental indicators accounts, along the lines followed by others, including de Haan, Keuning and Bosch (1993) and Keuning (1994). The advantage for policy purposes is that a SAM, as a meso framework, can conveniently bridge the micro and macro policy levels through the use of a limited but representative number of accounts.

The need for an "extended" SAM (labelled ESAM) follows from the fact that the indicators that one would want to introduce are of different nature than those included in a conventional money-metric SAM. Even more importantly, many indicators cannot be expressed in the same way as the conventional ones. The accounts in a conventional SAM are expressed in monetary terms, whereas the extensions are mainly expressed in physical terms (see below).

The comprehensive characteristic of the ESAM, as proposed here, facilitates in turn the development of a comprehensive approach. The approach considers socioeconomic aspects and their relations with aspects of well-being and the environment. The conceptualization of development can thus be more convincing in terms of the problems that typify it.

3.2 General Characteristics of the Extended SAM

Logically enough, the characteristics of an ESAM will mirror those which apply to conventional SAMs.

Well-being and the environment are intrinsically related to the production process, (imputed or monetized) household income, household consumption patterns and international transactions. It is then necessary that, in the first place, such SAMs show in an explicit and precise manner the key sectors, the institutional aspects of the socioeconomic system and production of commodities and basic needs goods and services, as well as the

mechanisms and the relations that typify them. In the second place, it is necessary to have an appropriate disaggregation and classification of those variables that are directly related to the objectives of the extension itself; for instance, it is important to display the levels of well-being of different socioeconomic groups, in monetary form as well as in physical form.

Theoretically speaking, extensions to the SAM - or for that matter to any accounting framework presented in matrix format - can be presented either in additional rows and columns, or in satellite tables. In practice, however, often a combination of additional rows and columns and satellite tables can be found (see e.g. Bartelmus, Stahmer, van Tongeren 1989; Keuning and de Ruijter 1991:191-193, UN 1993, UNSD 1993; de Haan, Keuning and Bosch 1993, Keuning 1994; Keuning and Timmermans 1995).

If extensions appear in additional rows and columns, the classification of the extensions is, by definition, identical to that of the account to which the extension is made. In the case of satellite tables the classification of the extension may be identical, but is usually more disaggregated. An example of an extensions by means of satellite tables is the "System of Economic and Social Accounting Matrices and Extensions" or SESAME as proposed by Keuning (1994). In the SESAME the disaggregation of the extension which appears in the satellite tables is not necessarily dependent on that of the account in the SAM to which the extension is made. Though, both are logically related through a coding system. The focus of Keuning, however, is on arriving at a meso-level system from which consistent macro-level monetary and non-monetary indicators can be derived, whereas our focus is on arriving at indicators at the meso-level. To be more specific, our aim is to integrate the system of social indicators as proposed by others, e.g. Vos (1993), with the by now well-established tool of the SAM. Concerning the environmental indicators, our focus is also more on the meso level than on the macro level, because we see the extensions of the economic accounting relations with both sets of indicators as a first step towards a more integrated analysis of aspects of sustainability problems.

Extending the SAM by means of adding rows and columns to the SAM itself - that is, include accounts and modules appended to the SAM - has the advantage that the links can be presented more clearly. In this paper the extensions are therefore proposed to be presented in that way. In schematic form the method that is proposed can be found in Table 2.

It should be clear that extensions of the SAM with physical indicators, whether presented in non-monetary rows and columns or in satellite tables, do not in any way alter the nature of the basic money-metric SAM; they simply complement it.

In Table 2, modules that show social indicators appear in the account labelled (SI); those indicators that refer to the environment appear in the accounts labelled (SA) and (SB). Extensions appear as additional rows and columns to the SAM, i.e. adjacent to the money flows. It must be taken into account that as it is impossible to add them together, the totals are presented separately; first the monetary totals of the ESAM are presented (TOTAL), analogously to the conventional SAM.

The extensions with social indicators and with environmental indicators of the 1989 SAM of Bolivia are presented in Tables 3 and 4 respectively.

From Tables 2 and 3 it can be verified that there are three main modules which include the elements that reflect well-being. These can be found at the intersections of row 2 and column 9, of row 6 and column 5 and of row 9 and column 5. (Examples of other modules are total household income and total household expenditure, the totals of rows 5 and 6 of the SAM, respectively.) The three main modules include indicators of nutrition, education, health, housing, etc. The first module (CM-2,SI-9), labelled "input indicators",[9] reflects the amounts of *satisfiers* which the economy has at its disposal to satisfy basic needs (e.g. the number of schools in the case of education) and/or public policy. The second module (BN-6,HH-5) consists of the so-called "access indicators", reflecting the capacity of households to satisfy their basic needs (e.g. total income or expenditure). The third module (SI-9,HH-5), that of "output indicators" includes those indicators that reflect the degree of satisfaction reached, which will depend on the interaction of input and access indicators. Output indicators are not to be confused with "outcome indicators". The difference between "output" and "outcome" indicators is that an output indicators for a particular basic need is conceived as the "direct" result of the interaction of input indicators and access indicators for that particular basic need, whereas an outcome indicator reflects an ultimate effect (e.g. a healthier life), that can be attributed to a combination of effects. The outcome indicators are not presented in the ESAM.

Access indicators that already form part of the SAM appear in module (BN-6,HH-5) and in the row totals of (HH-5) and (BN-6). Access indicators should also cover the "expenditures" and services provided by the State, such as education, health and other services. Those that can be allocated as "transfers" to households (HH-5,OI-4) are booked as part of their disposable income (see Section 3.3). Household income is an important *access indicator*, because it indicates the capacity of households to satisfy basic needs.

In addition to the access indicators included in the monetary part of the ESAM, there are

9 The basic conceptual framework about the typology of indicators can be found in Teekens *et al.* (1988). A further elaboration is presented in Vos (1993).

non-monetary access indicators, which mainly appear in (BN-6,SI-9). Some may relate to households and could be booked in (HH-5,SI-9) in Table 3, or $I_{5,9}$ in Table 2. In the case of housing, for instance, one can think of living permits, amounts of land for housing, membership of housing cooperatives, etc. to name a few. Concerning schooling and health, examples of non-monetary access indicators are the geographical distance to schools and hospitals respectively.

In Tables 2 and 4, the inclusion of environmental indicators in physical terms is basically brought about by the introduction of a row and column that form the so-called 'Substances account'. In addition, a column called 'Balance of Substances' has been included in order to accommodate the balances from the Substances account.

The column of the Substances account registers the supply of substances (i.e damaging substances as well as valuable depletable ones), the row their destination/use. The supply of damaging substances through domestic production activities, consumption activities and imports is recorded in modules (PA-1,SA-10), (BN-6,SA-10) and (RW-7,SA-10) respectively, while in addition the supply of depletable substances, through discovery of new reserves, is booked in module (KA-8,SA-10). The destination/use of substances is booked in modules (SA-10,PA-1) for the use of depletable substances in domestic production activities; (SA-10,RW-7) for the export of damaging substances; and (SA-10, SB) for the residual, i.e. the balance. The interpretation of that balance will depend on the nature of the substance, and is further discussed in Section 3.4 below.

3.3 Extension of the SAM with Social Indicators

The extended social accounting matrix serves as a basis for computation of a large number of indicators of household welfare, both monetary and non-monetary ones.[10] A SAM with extentions can be used for monitoring social development and for the analysis of the impact of economic and social policies on the degree of poverty and well-being of the population.

As mentioned above, the SAM as a matrix of flows in monetary terms can be extended to incorporate social indicators in non-monetary terms, that may or may not *a priori* be directly linked to particular monetary flows. Such an extension of the SAM will be brought about by adding rows and columns to the conventional matrix and/or by presenting satellite tables, as explained above. Here we discuss the extensions by means of adding

10 See Vos (1993) for a list of social indicators

rows and columns. The entries in these rows and columns are expressed in physical amounts; this will facilitate the establishment of a direct link between these entries and corresponding monetary flows in the SAM (i.e. access indicators).

A complementary extension that is very useful for our purposes is the addition of rows that indicate for each household group the number of persons and the number of households.[11] Further, provided data are available, a row could be added to show the number of persons (or number of households) with income at a level below a pre-defined poverty line. Then, the incidence of poverty according to the income method could easily be calculated.[12] As suggested above, household income which appears in the conventional SAM is an important access indicator of the capacity of households to satisfy basic needs (apart from access indicators such as geographical distance to nearest location where services are provided); indeed, in the indirect measurement of poverty the level of income is compared with the cost of a normative basket of basic needs.

In the module for the extension with output indicators, rows can then be added for each basic need, to show physical quantities from which indicators of basic needs satisfaction can be derived. The complementarity of the direct and indirect approaches to poverty measurement (see e.g. Boltvinik 1994) can then be incorporated as an integrated part of the ESAM.

In a similar fashion, columns can be added to the monetary accounts that show physical quantities from which non-monetary input indicators can be derived for the goods and services incorporated in respective basic needs, (CM-2,BN-6) in Table 3. The corresponding input indicators are booked in (CM-2,SI-9). Other types of input indicators are the growth of the population and the number of households.

The expenditures of households are access indicators. These appear in module (BN-6,HH-5), at the intersection of the basic needs or wants account and the household account.

It is instructive to give some examples for extending the SAM with different social indicators. If we take the case of housing, examples of *input indicators* relate to the housing stock and the growth of the stock of dwellings. These can be the (change in) total number of dwellings occupied, the (change in) number of dwellings with particular

---

11 Note that in a similar fashion it is possible to include the number of employees by sector of activity as a physical indicator of employment. If data availability allows it, employment in each sector, preferably in full time equivalents, could be broken down by, for instance, level of education or socioeconomic status. If the "core" SAM includes similar breakdowns of monetary flows, various kinds of analyses would become feasible.

12 Including only the number of persons (or number of households) would allow for calculation of average income per capita (or per household), which could be compared with the poverty line. Such a calculation, however, gives less insight, because it treats the average person (or average household) as the statistical unit and not the individual person (or household) as in household survey data (cf. Pichot 1995 266).

facilities, such as electricity and tap water, and/or various proportions, such as the percentage of houses with electricity and the rate of growth of dwellings (cf. UN 1975:83).

It must be noted, however, that since the "core" ESAM is in terms of monetary flows, the relevant indicators that can be directly linked to the monetary flows must also be expressed in terms of flows. Defining V_{t-1} as the housing stock at the beginning of the accounting period and $I_{v,t}$ as the investment in housing during the accounting period, the flow of housing services v_t could be written as:

$$v_t = \alpha(V_{t-1} + I_{v,t}) + \beta_t$$

where α is a coefficient that reflects the share of the housing stock "used" during the accounting period and β the use of other housing services, such as electricity and water. In reality the actual stock of dwellings is made up of dwellings constructed in different periods (years) in the past. As long as a linear rate of depreciation can be assumed, it is feasible to convert the housing stock into a flow of housing services, without the need for knowing the composition of the stock in terms of year of construction. Then one could just as well include the indicators based on stock data in the ESAM, bearing in mind the stock-flow relationship expressed in the equation above.

One *output indicator* of housing refers to the (growth in) number of dwellings in the respective household groups. Such a number in itself does provide a first quantitative indicator of the housing condition of the population, if seen in relation to demographic data. If, alternatively, or in addition, for each household group the (growth in) number of dwellings with various facilities, the number of rooms and the number of dwellings owned by occupants is given, it is possible to derive indicators of occupancy and tenure (see also UN 1975:83). Comparison of the number of occupants per room with a desired ratio (or norm) would give a first indication of the shortfall in housing quality (cf. ILDIS 1987). Other, more genuine qualitative indicators can be derived, using information on the materials used for construction of dwellings, availability of water and electricity services and existence of toilet and sewerage facilities. As in the case of the input indicators, these can be linked to the monetary flows in the SAM if the output indicators are also expressed in terms of flows.

However, whereas some output indicators are of such a nature that it is not feasible, neither useful, to aim at establishing a direct link to the monetary part of the ESAM, for others it will be feasible and useful to link them in that way. The expenditures on housing in the wants account of the SAM refer to payment of rent, imputed rent for use of own house and expenditures on maintenance and use of basic services, such as water, gas and

electricity.[13] In those cases in which non-monetary indicators can be linked to the monetary part of the ESAM one could write for each household *h* the following relationship:

$$v_{h,t} = \alpha_h(V_{t-1} + I_{v,t}) + \beta_{h,t}$$

As mentioned, there are other output indicators that are of a different nature, though related to housing, such as the quality of housing reflected by the nature of materials of construction (of the floor, roof and walls).

Because of its nature, housing may be the most difficult example of social indicators. If, for example, education is considered, input indicators that could be linked to the SAM are the number of teachers, classrooms, books, etc., (or changes in these numbers) in relation to (changes in) the number of pupils/students, whereas output indicators refer to school attendance, the number of graduates or educational attainment in relation to demographic data. Likewise, in the case of nutrition, input indicators concern the daily consumption of food in terms of calories and proteins per person, whereas examples of output indicators are the sex and age-specific anthropometric measures of length and weight. In the case of health one could think of input indicators such as number of doctors, nurses and midwives or number of hospital beds per 1,000 persons, and of output indicators such as number of persons attended (also in relation to demographic data). But, output indicators of health, probably more so than in the case of other indicators, are also a function of inputs related to fulfilment of other basic needs. For example, improvements in health are also likely to be related to education: better education on hygiene is likely to result in less diseases. But the reverse relationship between health and education can also hold: healthier children are likely to perform better at school. Similarly, school performance may also be related to housing conditions. Here outcome indicators come in. Thus, an output or outcome indicator in one area of basic needs satisfaction can be an input indicator in another area. Of course, this only in a dynamic sense, whereas the complementarity can only be at the input side.

3.3.1 Data requirements and limitations

To extend the SAM, which is expressed in monetary flows, corresponding "flow data", as well as "stock data" are required that are expressed in non-monetary terms. An example

13 It is interesting to note that access indicators included in the wants account of the SAM would allow for calculating some of the indicators connected with housing services suggested in UN (1975:84), such as the share of the household budget allocated to housing.

of flow data are the goods and services consumed by households during the accounting period (usually a year) to satisfy their distinct basic needs. Another is that of inputs required for the "production" of the same basic needs. Stock data consist of, for instance, socio-demographic data, such as the number of households. Obviously, it is necessary to reconcile the classifications of the data in physical terms with those of the corresponding monetary parts of the SAM. To be more precise, sufficient information is needed to be able to make a breakdown of the data according to both household group and basic need category. In some cases the classifications can be matched on the basis of assumptions. In practice, the data in physical terms can be obtained from censuses, administrative records and, particularly, sample surveys, such as household income and expenditure surveys. In some cases, as a result of incomplete coverage of surveys, not level totals, but only ratios, can be obtained for the categories of households and commodities defined in the SAM. Further, since the accounting period to which the monetary flows in the SAM refer is usually a year, whereas the reference period in surveys is often much shorter, an appropriate conversion of data is required.

Another problem is related to the use of survey or census data to extend the SAM. It is likely that these include household production of goods and services that are not supplied to others on the market, but used for own final consumption. Acknowledging this problem, the 1993 SNA includes the production of goods for own consumption within its production boundary, but excludes within household production of services for own final consumption (with the exception of services produced by employing paid domestic staff and the own-account production of housing services by owner-occupiers). It will be difficult to establish a direct link to the corresponding monetary flows in the SAM in those cases in which it is not possible to single out from total household production as recorded in survey or census data the part of production (and hence consumption) that falls beyond the production boundary. In light of this, it is worth noting that to incorporate non-market household production, in the literature proposals have been put forward to extend the concepts in the central framework of the system of national accounts (see Pichot 1995:259-263). Pichot, however, notes that while supply of information on non-market household production activities seems desirable, it would be better to present it in satellite accounts, without changing the production boundary or adding supplementary imputations. Though, he does not in particular address the problem that concerns us.

3.4 Extension of the SAM with environmental indicators

The extension of the basic SAM framework with environmental data aims at establishing links between the economic system on the one hand, and the natural environment on the other. More in particular the aim is to shed light on the impact of different economic

activities on the environment.

In general, environmental data can be quite diverse in nature. Without being exhaustive, one could say that they include data on the following: the state (in terms of quantity and/or in terms of quality) of environmental assets; changes in their state as a result of degradation, depletion, or restorative activities; the specific media (including emissions of certain chemical substances; disposal of waste etc.) which are among the causes of degradation. Other types of data may refer to protective and preventive activities taken to avoid deterioration of natural assets.

From the above, and analogous to that of the social indicators, it can be concluded that some types of environmental data refer to stocks (e.g. data on quantities of natural assets, referring to a particular point in time), while others refer to flows (e.g. data on flows of substances emitted over a period of time, in this case the accounting period).

Furthermore it may be observed that while many types of environmental data are in the form of physical indicators of one kind or the other, other types are in monetary terms. In the latter case one could think in the first place of data on actual expenditures associated with preventive, protective or restorative activities. But in addition one could think here of expressions in monetary terms which relate to the value of natural assets, or changes therein, for example as a result of uses of these assets for economic purposes (i.e. degradation, depletion etc.). While in the first case the valuation is related to stocks, in the second valuation is related to flows. In this context it is worthwhile to observe that the use of value expressions in relation to stocks of natural assets and flows associated with them form an issue of considerable dispute in both theoretical and applied literature.[14] The origin of this dispute stems from the fact that for many types of natural assets, and associated flows, it is not possible to identify market prices. This in turn may be explained by the fact that many of these types of natural assets are of such a nature that they - mainly for technical reasons - cannot be the subject of private ownership, as a consequence of which they cannot easily be subjected to market transactions. Therefore, in all cases were natural assets and their use is not connected with market transactions, no easy reference can be made to market prices for purposes of expressing these stocks and flows in value terms. In such cases, only alternative valuation methods can be adopted. In many of such cases there is an element of arbitrariness with regard to the kind of alternative valuation method to be selected (UN, 1993 and Markandya, 1994).[15] As a result, non-market valuation is often a source of dispute, for which reason one may

---

14 See, for example, Franz and Stahmer (eds.) (1993); Keuning (1992), Turner, Pearce and Bateman (1994); or UN (1993).

15 In the literature several alternative methods are proposed. Among them there are six that can be considered the most important: 1) hedonic prices; 2) contingent valuation; 3) travel costs; 4) dose-response; and 5) heuristic; for this five see Markandya (ed.)(1994:87-95); and 6) accounting for time use, proposed Pyatt (1990 and 1994).

prefer to avoid the use of it, and rather work with physical indicators only.

As has been already indicated in Section 3.2, the SAM may be extended with environmental data in physical terms, through the introduction of two simple types of environmental accounts, i.e. a 'Substances account' and a 'Balances of Substances account'. While the first one has, as is normal, a row and a column, the second one is not an account in the usual sense, as it consists of a column only. This column serves the purpose of providing the (necessary) counter-account in which the balancing item from the 'Substances account' can be recorded.

The 'Substances account', which is in fact the most important one, provides flow data on the origin/supply and destination/use of a number of substances that affect in one way or the other the natural assets. As was made clear already earlier, the term 'substances' refers not only to matter which is of a damaging nature (e.g. emissions of chemicals, waste, etc.) but also includes valuable matter in the form of depletable natural resources. Obviously, in a full-fledged ESAM the account will be broken down into a number of sub-accounts, corresponding to the various kinds of substances distinguished.

In the case of damaging substances the supply comes from domestic production, from the (unwanted) import of substances, and from consumption activities. The relevant data are represented, respectively, at the intersections of the column of the substances account with the row of productive activities account, with the row of the rest of the world account, and with the row of the wants account.

In the row of the substances account we show the destination - or, the use - of the total supply of these damaging substances. While some of it may be exported, and booked at the intersection with the column for the rest of the world account, another part (usually the larger) remains in the domestic environment, and is presented as the residual. This residual is booked in a column called 'Balance of Substances'.

It may be noted that for certain damaging substances it may not be of relevance to establish how much has been imported and/or exported. This applies in particular to those compounds of which the environmental impact is of a global rather than of a specific locational character.

Examples are substances that contribute to the Greenhouse effect (e.g. CO_2, CH_4), or to the breaking down of the ozone layer (CFCs, halons). In the case of these substances, a zero value may for accounting purposes be imputed to the imports and exports. As a result, total supply will in these cases be equal to the amount generated of these damaging substances by domestic economic activity; furthermore, as exports and imports are given

a zero value, the residual equals total supply. This residual is again booked in the 'Balance of Substances' column, and may be interpreted as the increase to the global stock of these damaging substances due to domestic economic activity during the period in question.

In the case of valuable depletable substances the supply comes from increases in reserves due to new discoveries or changes in extraction conditions (if any). This may be recorded at the intersection of the column of the substances account with the row of the capital account. The use of valuable depletable substances is through extraction.

The balance of the supply, i.e new discoveries, changes in extraction conditions etc., and the use, i.e. actual extractions, represents a net addition (which can be positive or negative) to the stock of that substance, and is again booked in the column 'Balance of Substances', under the appropriate sub-heading.

The data in the environmental accounts presented above are expressed in physical terms. In analogy to the social indicators account, these accounts also intersect with a number of the monetary accounts of the conventional SAM (e.g. the production account, the wants account, or the rest of the world) they do not affect the monetary totals of these accounts of the conventional SAM (see Table 4).

It should be borne in mind that the form of the extension presented in the schematic SAM and the concrete proposal just described, constitute only one of the various ways in which environment-related data can be incorporated in a SAM framework. Furthermore, the choice of the specific types of environmental accounts (i.e. a 'Substances account' and a 'Balances of Substances account') as poposed here has been determined by the environmental data available at the time of compilation of the extended SAM. These data refer to emissions and depletions, estimated for a one-year period. As such these kinds of data, which are probably among the more readily available kinds of environmental data in a number of country cases, can be characterized as flow-data, and the accounts as flow accounts. No stock accounts, in which environment-related stock-data are presented, form part of the environmental extensions proposed for the present SAM. Environment-related stock accounts, in which among other things data on stocks of natural assets or on accumulated pollutants may be presented, could form further extensions, provided data would become available. Another kind of environment-related extension that could be thought of, depending again on data availability, would be one involving the disaggregation of the production and commodity accounts in order to show explicitly the production of goods and services associated with environmental protection and restoration. In a similar vein could environment-related tax policies be made visible through an appropriate disaggregation of the current accounts for institutions. It may be remarked, however, that the different kinds of disaggregations as referred to here involve accounts that form

already part of the conventional money-metric SAM, rather than new types of accounts that have to be added to the conventional ones.

3.4.1 Data requirements and Limitations

In order to construct the 'Substances account' and the 'Balances of Substances account' as suggested above, physical data will be required on different kinds of substances, damaging as well as depletable valuable ones, cross-classified by the relevant kinds of transactions that affect their supply and use.

In the case of damaging substances that have a specific domestic impact, data would be required, for each kind of substance distinguished, on quantities generated in conjunction with different production activities; on quantities generated in conjunction with different consumption activities; on quantities imported and exported. In the case of damaging substances that have a global impact, similar kind of data would at least be required on quantities as related to production and consumption activities. Finally, in the case of valuable depletable substances data would be required, for each of the substances distinguished, on quantities/volumes newly discovered as well as on quantities/volumes extracted in the various productive activities concerned.

Data on quantities of damaging substances related to production and consumption activities may come from surveys which aim at measuring these quantities directly. Alternatively, they may be calculated with the help of known coefficients, which are being applied, in the case of production activities, to levels of output or input (e.g. energy consumption). Data on imports and exports of damaging substances should come from surveys; their availability will often cause problems. As far as valuable depletable substances is concerned, data on newly discovered quantities and on quantities extracted may come from different sources (government agencies, mining companies etc.), although they are sometimes difficult to obtain.

In Section 5 details will be presented on the actual data sources used for compiling the environmental accounts of the extended SAM for Bolivia for 1989.

4 Incorporating Indicators of Housing in the 1989 SAM for Bolivia

The purpose of this section is to illustrate the incorporation of input, access and output indicators in the 1989 SAM in the case of housing. The indicators that are used here are derived from three sources: from data of the integrated household survey conducted by the Instituto National de Estadística (INE) in November 1989 (from now on referred to as EIH89), from census data and from estimates of a survey conducted in rural areas in 1995.[16]

4.1 Classification of Households

Households in the 1989 SAM are classified into urban and rural households. Urban households, in turn, are classified according to level of income into urban high, middle and low income households, on the basis of occupation and sector of activity of the head of the household (see UDAPE 1990). For that reason, while using the EIH89 data, a large effort has been made to apply the same classification with respect to the income levels and the occupation and sector of activity of the head of the household (see Table 5 for the assumptions that have been made). Households of which the head was not declared as being employed have been classified as low income households. A check was made on total income of such households by using income quartiles; almost all of these households fall in the first or second income quartile.

4.2 Input Indicators

As suggested above, examples of input indicators are the growth of the total population and the (growth in the) stock of dwellings. To start with, an estimate of the total population in 1989 was made by means of intrapolation of the figures of the 1976 and 1992 censuses, using the intercensal compound growth rate. The total population (living in private or collective households) in 1989 calculated in this way is 6.035 million persons; this estimate appears in the first column of the social indicators account of the extended SAM (see Tables 3 and A.1). The estimated growth of the population in 1989 is shown in the next column.

---

16 The EIH89 is a household sample survey conducted in urban areas, stratified into Department Capital cities (including El Alto, but excluding Cobija), which are autorepresented, and other cities with a population of over 10,000 inhabitants. Within capital cities and other urbanized centres, samples were selected using two-stage probability sampling, with *manzanas* as first stage sampling units and households as second stage units. The realized sample size is 7,624 households, comprising 37,864 individuals (see INE 1990). For lack of coverage of rural areas by the EIH89, the survey of 381 households in rural areas of the Departments of La Paz, Oruro, Potosí and Cochabamba conducted by UDAPSO in May-June 1995, to arrive at output indicators of housing for rural areas. These indicators are proxy indicators for 1989. For details on the survey in rural areas see Burger and Pradhan (1996). In addition, some output indicators have been derived from census data.

The 1976 and 1992 censuses also contain data on the number of (occupied and non-occupied) individual dwellings (see UDAPSO 1993, Table 1.1). For this reason, it is possible to calculate the intercensal growth rate of the stock of dwellings.[17] The calculated growth rate has been used to arrive at an estimate of the stock of dwellings at the end of 1989 and its growth during that year, booked in (CM-2,SI-9) in Table 3.

Another input indicator is the number of houses constructed in 1989 with the help of finance from the Fondo National de Vivienda (FONVI), see Anuario Estadístico 1994 (INE 1995). This number also appears in the same row in Table 3

4.3 Access Indicators

As discussed in the previous section, the SAM contains access indicators that are valued in monetary terms, *viz.* total income per household group, shown in the row totals of the households account; and, expenditures on the respective basic needs, including housing, shown in the intersections of the columns of the households account with the rows of the basic needs account, (BN-6,HH-5) in Table 3.

It should be noted that the wants account of the 1989 SAM for Bolivia refers to private outlays that satisfy basic needs only; in other words, it excludes public services. Following national accounting conventions, the latter appear as public consumption in the "Other institutions" account. However, to the extent that public services are "divisible" (as opposed to "pure" collective services) - that is, to the extent it can be identified in which way distinct groups of households directly enjoy these services - one could use the concept of extended consumption of households to assign them to the beneficiaries. The concept of extended consumption adds "divisible" public services to private consumption (Pichot 1995:264-265). In practice it is likely, however, that in most cases the beneficiaries of these services cannot be exactly identified, or not be identified at all. A concrete example refers to the problem of assigning to each household group those government outlays in the areas of health and public education.[18] In the construction of the 1989 SAM for Bolivia no attempt has been made to assign public consumption to different groups of beneficiaries.

From the disaggregated SAM it can be read that, for example, the expenditure on housing

17 The data available of the 1976 census relate to the total of occupied and non-occupied dwellings, excluding collective dwellings. Accordingly, the intercensal growth rate has been calculated for the growth in total (occupied as well as non-occupied) individual housing units.

18 The same goes for non-profit institutions serving households, see the System of National Accounts 1993, Chapter 18 (UN 1993). A concrete case appears in Vos (1988)

by rural households amounted to 119 M.Bs in 1989. These expenditures are excluding any public expenditures on housing.

4.4 Output Indicators

Important output indicators of housing are crowding (number of persons per dwelling or per room), type of dwelling, safety of the dwelling (according to materials used in construction of the dwelling), location of the kitchen and availability of basic services. The first rows of the social indicators account in the extended SAM for Bolivia show, for each household group, the number of households, the population and the average number of persons per household (or, occupied dwelling).[19]

In the 1992 census, data have been collected on the characteristics of housing of households living in individual dwellings that were present at the time the census was conducted. If it is assumed that the housing conditions of households that were not present do not differ from those of households that were present, then the totals for all private households can be inflated accordingly.[20] The same goes for the total number of private households; according to the census data, the stock of occupied dwellings with occupants present is equal to the number of households present at the time of the census. Therefore, the total number of private households (present and not present) is equal to the total number of occupied dwellings. This figure has been booked in the column "Grand Total" of Table 3.

According to the 1992 Census, the population in private households stood at 6.293 million in 1992. Since we did not have a comparable figure for 1976, we have used the intercensal growth rate of the total population. This yields the total of 5.915 million persons living in occupied individual dwellings shown in the second row of the social indicators account, in the column "Grand Total". The 1989 rural population has been estimated in a similar way, whereas the urban population in 1989 has been calculated as the difference between the total and the rural population. The urban population, in turn, has been sub-divided into persons living in high, middle and low income households; for this sub-division use has been made of proportions obtained on the basis of EIH89 data.

Comparison of the 1992 population with the number of households yields the average

19 The EIH89 indicates somewhat higher ratios for all three urban household groups which, in addition, appear to be positively correlated with income. In order to maintain consistency with the input indicators discussed earlier, it has been decided to assume a uniform ratio for all groups equal to the average number of persons in urban households.

20 As will be discussed below, for urban areas we make use of the EIH89 data on housing conditions.

number of persons per household. These averages have been calculated for rural areas and for the country as a whole. Assuming that the average household size in 1989 was the same as in 1992, the total number of (rural) households in 1989 can be calculated by dividing the (rural) population living in private households by the average number of persons per (rural) household. For the number of urban households also the residual method has been adopted. Applying the above-mentioned proportions of the EIH89, in turn the number of high income, medium income and low income households have been estimated. The number of households per urban household group and that in the group of rural households are shown in the first row of the social indicators account. The total for the country as a whole appears in the column "Grand Total" of Table 3.

The next rows show the number of dwellings owned by the occupiers, the number of dwellings by main types (independent houses, apartments and separate rooms) and the overall number of rooms and bedrooms. The numbers in these rows have to be read in conjunction with the number of households (or the population) within each group. For example, comparison of the total number of the above-mentioned main types of dwelling with the number of households indicate that the shortfall of what may be called acceptable accommodation is 255 units (1% of the total) for the urban high-income group, a gap which compares favourably with a deficit of more than 110 thousand units (14% of the total) for rural households. Finally, rows are included in the SAM that indicate the population living in dwellings owned by the occupiers, in safe dwellings, in dwellings with a separate kitchen, in dwellings without a room exclusively used as bedroom, in dwellings with availability of basic services and the number of persons in each of the three main types of dwellings.[21] Using these data and looking at aspects of safety, it can be seen that whereas almost 90 per cent of the population in urban areas is living in a safe dwelling, the housing situation of an overwhelming majority of the rural population (comprising more than 2 million people) is precarious.

4.5 The Links of Input and Output Indicators to the Monetary Part of the SAM

In the paragraphs above the manner of including housing indicators in the extended SAM has been presented. From this presentation it can be deduced that the nature of these indicators is such - they are in terms of stocks - that in the majority of cases only an indirect link can be made to the monetary flows in the SAM. Nevertheless, and as discussed in Section 3, in order to directly link the indicators to the monetary flows, they will have to be expressed in terms of flows as well.

---

21 In their analysis of the survey data for rural areas, Burger and Pradhan (1995) define a dwelling as safe if it has a safe floor, safe walls and a safe roof. In turn, a safe floor is floor made of concrete, stone, tiles or wood; a safe wall is a plastered, brick or wooden wall; and a safe roof is a roof made of zinc, roofing-tile, wood, or a roof with a separate ceiling. The same criteria have been applied to the EIH89 data on housing.

5 Incorporation of Environmental Indicators in the 1989 SAM for Bolivia

In order to illustrate how to introduce indicators related to environmental data, following the guidelines regarding the method of extension introduced in Section 3.2, and as further discussed in 3.4, a simple application for the Bolivian case is presented below.

First of all, it should be observed that quantitative data on environmental aspects for Bolivia are very limited; consequently, the extension of the Bolivian SAM with this kind of data at this stage must, for the moment, remain limited as well.

For purposes of illustration we use environmental data for Bolivia for the year 1990; the data come from papers presented at the Seminar-Workshop on the environment which took place in Bolivia during the first half of 1996.[22]

The original data appear in Table 6A. This table basically refers to emissions of green-house effect gases (GHEG) that are of anthropogenic nature, i.e. emanating from different kind of economic activities. More in particular these include: emissions related to the use of fuels in different kinds of productive activities; emissions related to agriculture and livestock; emissions related to the clearing of forest area; emissions related to changes in the use of cultivated land and the burning of agricultural waste; emissions related to the treatment of water and sanitary waste; emissions related to the extraction of natural gas and petroleum, and the generation of biomass. The data compilers have used OECD norms and methods to calculate the levels of GHEG emissions, which are expressed in Gg (giga grams). Table 6A gives moreover data related to the depletion of natural resources (more in particular on the production of natural gas and petroleum).

In order to present the data from Table 6A in conformity with the Bolivian SAM the data on GHEG emissions have been re-worked; these data are presented in Table 6B. The figures in absolute terms for CO_2, CH_4, and CO in this table are the same as those introduced in the environmental account modules which appear in the ESAM (see Table 4). The quantities for the remaining GHEG gases from Table 6B are not shown individually in the ESAM, but are presented in aggregate terms.

At this point it seems interesting to present a brief analysis of the data presented in Tables 6A and 6B, and their significance. However, it should be realized that the data are not exhaustive. In fact, only data for those pollutants for which the quantities emitted can

22 The data come from summaries of papers presented to the Seminar Workshop sponsored by the Ministry of Sustainable Development during 1996. The methods used by the authors (see Table 5) follow the manual "Normas de Orientación para Inventarios de Gases Invernadero del Panel Intergubernamental sobre el Cambio Climático (IPCC OECD 1995).

more easily be estimated are available; hence the analysis should not be considered conclusive but mainly illustrative and to a certain extent indicative.

1. Looking at GHEG emissions by productive sector, it is clear that as much as 86.6% (i.e. 78517.8 Gg) is associated with Modern Agriculture, e.g. burning and logging. In fact the largest part comes from the burning of forest area (i.e. 51152.8 Gg) for the purpose of clearing land. From an accounting point of view the clearing of land may be considered a secondary activity of agriculture. Hence the GHEG emission associated with land clearing have in the SAM been linked to agricultural production. Hydrocarbon and Natural Gas appear as a far distant second, producing 7.4% of all emissions, while Transport contributes only 2.7%, Manufacture 1.8% and Electricity and Energy 1.5%.

2. For each individual pollutant, except NMVOC, it appears that it is mainly generated in the agriculture-forestry-livestock sector. The percentages vary from 56.1% for NO_x to as much as 95.7 for CH_4 and 100% for C. NMVOC on the other hand is associated with transport only, the third most important polluting sector. For this sector emission are the highest for three out of the seven, namely NO_x (34.2%) and NMVOC (100%).

3. Looking at the emissions by type of pollutant, it appears that out of the seven types distinguished the most significant is CO_2, with a share of 97.2% in the total of emissions. CO emissions are the next most important pollutants, with 1.4% of all emissions.

4. Looking at emission by "types" generated via the use of fuels (see Table 6A.1), those defined as of "stationary source" type account for as much as 47.2% (distributed as follows: Manufacturing 25.8%; Energy and Transformation 11.6%; and Commercial Services, Public Services, and Residential Uses 9.8%[23]). While the "mobile source" type, mainly associated with Transport, amounts to almost 40%. The third type, "fugitive source", associated only with petroleum and natural gas extraction, amounts to 12.8%.

5. As far as emissions associated with "agriculture and livestock" are concerned (see Table 6A.2), savannah burning is the main culprit among the various activities distinguished; it accounts for as much as 58.1% of the GHEGs generated, followed

23 As far as Commercial and Public Services is concerned, it has been assumed that the use of fuels has been mainly used for purposes of energy generation. As the emission data relate to Commercial and Public Services together with residental uses, we have, in the absence of further details regarding the precise breakdowns, allocated the emission data in their entirety to electricity generation activities, at least provisionally. In a future revision of this study a more appropriate allocation may be attempted.

by livestock (38.3%). And as indicated before, out of emissions associated with changes in the use of land and waste (6A.4) logging of biomass is the highest, amounts to 99.9%, and represents only CO_2 emissions.

6. Part of the emissions are related to the burning of agricultural waste and to the treatment of sanitary waste (i.e. a recycling activity). While these activities generate certain GHEG emissions on the one hand, they reduce the quantity of waste present on the other. Unfortunately, no data on the supply and use (including recycling) of waste itself are available.

7. As far as depletable natural resources are concerned, the production data on natural gas and petroleum (i.e. Tj 140544 and Tj 48579 respectively) may be taken as measures of the quantities depleted of these two types of resources. No data are available on new discoveries, however.

The data on emissions as presented in Table 6B and those on depletion as presented in Table 6A are the ones that have been included in the environmental accounts of the ESAM. As these data apply to the year 1990, it has been assumed that they do not differ significantly from those for the year 1989, the year to which the ESAM refers.

Table 4 illustrates in a schematic form how the data have been incorporated in the ESAM. From the table it can be seen that, as mentioned earlier, accounts 1 to 8 refer to the money metric conventional SAM, their totals appearing after account 8. Subsequently the accounts showing the social indicators and the environmental indicators are presented. More specifically account 10 includes the substances, while column SB shows the Balance of Substances. The substances distinguished are: four kinds of GHEH emissions; natural gas; petroleum; waste. Although no data for the waste sub-account are available, it has nevertheless been included for purely illustrative purposes.

The data appearing in (PA-1,SA-10) record values for four types of GHEG emissions by branch of economic activity. For instance, traditional agriculture shows an amount of 61.1 Gg in the intersection with CO_2, while modern agriculture shows an amount of 76256 Gg in the intersection with CO_2, 1088.69 Gg with CO, 574.11 with CH_4 and 600.81 Gg with "Other GHEG". Mining (only hydrocarbons and natural gas) shows an amount of 6702.7 at the intersection with CO_2, and an amount of 1.93 Gg with CH_4. The other remaining two sectors show also entries in their corresponding intersections.

The way in which the emissions have been booked reflect the consideration that all the emissions may be interpreted as outputs of an undesirable character that result from activities, say agricultural production or transport, as these outputs are not purchased by

any institution but rather tolerated. At the same time all of them represent (net) additions of unwanted substances emitted into the natural environment.

Depletions (related to gas and oil) have been recorded at the intersection of the row of the Substances account and that of activities related to mining. To be precise, an amount of 140544 T_j has been booked at the intersection of the row of the Substances sub-account Natural Gas with the column of the Activities sub-account Mining, while an amount of 48579.0 T_j has been booked at the intersection of the row of the Substances sub-account Petroleum with the column of the Activities sub-account Mining (SA-10,PA-1). These depletions may be interpreted as "free" intermediate consumption (without direct cost) used in the production process of the mining sector; at the same time, and similarly to changes in the stock of natural forest, these elements pertain to the category of non-renewable reductions of valuable substances that form part of the stock of natural assets.

At the intersection of the Substances account an the "Balance of Substances" column (SA-10,SB) the balances are shown for the different categories of substances distinguished here. The balance for CO_2 amounts to 88163.2 Gg, that for CH_4 to 597.76 Gg, that for CO to 1282.34 Gg, and that for Other to 649.44. As explained in Section 3.4., for these kinds of substances these balances may be interpreted as representing the increase to the global stock of these damaging substances due to domestic economic activity during the period in question.

The balances for the flows of Mining (gas and oil), amounting to 140544.0 T_j and 48579.0 T_j respectively, appear as negative figures, as the depletions are not being offset by any new discoveries. As such the negative figures for the balances of these flows refer only to the net reductions of the stocks of these valuable depletable substances.

As indicated already, although no data for the waste sub-account are available, this account has been included for purely illustrative purposes. Had data been available on either the generation of waste through productive activities, through consumption, or through imports, these data would have been presented at the intersections of the column of the Substances sub-account Waste and the rows of the Activities account, of the Wants account, and of the Rest of the World account. Any export of waste would have been booked at the intersections of the row of the Substances sub-account Waste, and the column of the Rest of the World account. In the absence of data, we have introduced zero (0) figures at the relevant intersections. In this case, obviously, the balancing item (which may be interpreted as the net change in stock of this damaging substance in the domestic territory) is equal to zero as well.

Finally, it should be stressed that the data on substances as presented in the Bolivian

ESAM refer to flows only. It should be taken into consideration, however, that for some substances (certain kinds of GHEGs, gas, oil, etc.) it is equally important to have data referring to the respective levels of stocks. Only then a more comprehensive analysis of the overall situation of the environment (including natural assets) in conjunction with the economic process would be possible. Efforts should be made to make available the required kind of data in order to enable a further extension of the SAM framework for purposes of this more comprehensive type of analysis.

6. Concluding remarks

By way of conclusion it can be said that, in principle, it is relatively simple and certainly useful to extend the money-metric SAM to include physical wellbeing and environmental indicators. This follows, it must be stressed again here, from the fact that the method proposed is consistent with the main postulates and objectives of SAMs, and the SNA for that matter, systems which have been adopted by the large majority of countries.

In terms of the Bolivian case and taking into account the limited data availability, two tentative conclusions can be put forward. On the one hand, the figures show that the country has a significant deficit in terms of housing, lacking in quality, high density of occupancy and deficient facilities. On the other hand, regarding the environment it is clear that the country shows characteristics of an incipient industrialization, poor and "excessive" use of surplus land and forest, explaining for up to now low levels of pollution.

As was illustrated with the housing component, the inclusion of social indicators is no doubt straightforward, and seems direct and feasible to implement in practice, provided there are recent censuses and (integrated) income and expenditure household survey data. Even more important, the concrete proposal to distinguish several types of social indicators, linked directly and indirectly to the conventional SAM, no doubt constitutes a significant advantage. This is specially true if the intention is to follow up or monitor social development in time. It is even more important if the purpose is to develop a set of instruments that, on the one hand, facilitates the formulation of social policy, and on the other, discriminates the different needs so as to allow for assessing the impact(s) on them.

Extending the SAM with environmental indicators also seems feasible, as demonstrated by our application, as well as by a number of other studies. However, in terms of environmental indicators the problem related to data appears as the most intractable, both for flow-type of data and for stock-type of data. Nonetheless, and keeping in mind the negative effects which originate in certain activities and household consumption on the environment and health, it seems superfluous to stress on the importance of efforts to generate the relevant information on emission and depletion and putting it in a consistent framework.

Future work based on the approach adopted in compiling the 1989 ESAM for Bolivia may include the following:

- Further extensions of the 1989 Bolivian ESAM with additional flow-type indicators as well as with stock-type indicators. As far as the social indicator modules is concerned, one could think of attempts to include data related to health, nutrition,

education, and other areas of basic needs satisfaction. As far as the environmental accounts is concerned, this may involve the inclusion of flow data (if any can be found) on other kinds of emissions; on waste; and on depletions of natural resources other than gas and oil. Furthermore, it may involve the inclusion of stock data on natural resources and on accumulated pollutants. In addition, attempts might be made to disaggregate the production and commodity accounts in the money-metric part of the ESAM in order to show explicitly the production of goods and services associated with environmental protection and restoration. Also attempts to disaggregate the current accounts for institutions, in order to make visible environment-related tax policies, could be mentioned in this connection.

- Compilation of an ESAM for Bolivia, having the same or a more extended format, for a more recent year;

- Compilation of ESAMs, having the same or a more extended format, for other developing countries.

Finally, it seems only logic to recommend the construction of ESAM-based models and to explore the development of the required algorithms to solve them. This is only way one can assess the robustness of method, and together with the extended SAM, to develop CGEs which include aspects of sustainability.

References

Adelman, I. and J.E. Taylor, (1990), Is Adjustment with a Human Face Possible?, The Case of Mexico.

Alarcón, J., J. van Heemst, S. Keuning, W. de Ruyter and R. Vos (1991), *The Social Accounting Framework for Development, Concepts, Construction and Applications*, Aldershot: Avebury.

Alarcón, J. V. (1990) La Matriz de Contabilidad Social y la Planificación de las Necesidades Básicas, in *Necesidades Básicas y Desarrollo*, ILPES-ISS-ILDIS, Hisbol La Paz - Bolivia, Publicación de Ponencias en el Seminario sobre Necesidades Básicas y Desarrollo sponsored by ILPES-ISS and the Ministerio de Planificación y Coordinación - 1989.

------- (1996) "Introduction to Social Accounting Matrix Modelling; An Application to Ecuador SAM-1975". The Hague:ISS (mimeo).

Bartelmus, P. (1990), "Sustainable Development: A Conceptual Framework", United Nations, Department of International Economic and Social Affairs, Working Paper 13, New York.

Bartelmus, P (1994), *Environment, Growth and Development; The Concepts and Strategies of Sustainability*, Routledge: London.

Bartelmus, P., C. Stahmer and van J. Tongeren (1989), SNA Framework for Integrated Environmental and Economic Accounting, *Economic Systems Research*, Journal of the International Input-Output Association, CARFAX, London.

Boltvinik, J. (1994), "Poverty Measurement and Alternative Indicators of Development", in R. van der Hoeven and R. Anker (Eds.), *Poverty Monitoring: An International Concern*, Basingstoke and London: St. Martin's Press.

Burger, K. and M. Pradhan, "Poverty in Rural Bolivia: 1995", Amsterdam: University of Amsterdam (draft for discussion).

Bourgignon, F. W. H. Branson and J. de Melo (1989), "Adjustment and Income Distribution: a counterfactual analysis", Policy Planning and Research Working Papers, The World Bank.

Cornia, G.A., R. Jolly and F. Stewart (eds.)(1987), *Adjustment with a Human Face: Protecting the Vulnerable and Promoting Growth*, London: Oxford University Press.

Dervis, K., J. de Melo and S. Robinson (1982), *General Equilibrium Models for Developing Policy*, Cambridge University Press.

Fargeix, A. and E. Sadoulet (1990) "A Financial Computable General Equilibrium Model for the Analysis of Ecuador's Stabilization Programmes", OECD Development Centre Studies, Technical Paper No. 10, Paris: OECD.

Franz, A. and C. Stahmer (Eds.) (1993), *Approaches to Environmental Accounting*, Physica-Verlag, Heidelberg.

de Haan, Mark, S. J. Keuning and P. Bosch (1993), *Integrating indicators in a National Accounting Matrix including Environmental Accounts (NAMEA)*. Occasional Paper Nr. NA-060, Statistics Netherlands, Voorburg.

van Heemst, J. (1991) "Introduction: The Social Accounting Framework for Development" in Alarcón, et al., *The Social Accounting Framework for Development*, Avebury Aldershot, USA.

ILDIS (1987), *Temas de Política Social. La Vivienda*, La Paz: Instituto Latinoamericano de Investigaciones Sociales (Diciembre 1987).

INE (1990), *Encuesta Integrada de Hogares, Segunda Ronda: Ciudades Capital y El Alto, Poblaciones Mayores de 10.000 Habitantes*, La Paz: Ministerio de Planeamiento y Coordinación, Instituto National de Estadística (Julio 1990).

INE (1995), *Anuario Estadístico 1994*, La Paz: Ministerio de Planeamiento y Coordinación,

Instituto National de Estadística.
Inter-Secretariat Working Group on National Accounts (1993), *System of National Accounts 1993*, Brussels/Luxembourg, Paris, New York, Washington, D.C.: CEC-EUROSTAT, IMF, OECD, UN, World Bank.
Keuning, S. and W. de Ruyter (1991), "The Social Accounting Framework: Outline of Construction Stages and Organization of Work", en Jorge Alarcón *et al.* (eds.):191-219.
Keuning, S. J. (1992): *National Accounts and the Environment; The Case for a Systems Approach*. Occasional Paper Nr. NA-053, Statistics Netherlands, Voorburg.
Keuning, S. J. (1994), SAM and Beyond: Open SESAME, *Economic Systems Research*, Vol. 6, No 1, pp. 21-50.
Keuning, S.J., and J.G. Timmerman (1995), "Integrating Environmental Data Into the SESAME", Occasional Paper Nr. NA-076, The Hague: Netherlands Central Bureau of Statistics.
Markandya, A. (ed) 1994, "Policies for Sustainable Development: Four Essays", FAO, Economic and Social Development, Paper 121, Rome.
OECD (1995), "Invetariación de Emisiones de la IPCC", IPCC/OECD, Vol 3, 1995.
Paz, O, (1996)"Emisiones de Gases Efecto Invernadero Provenientes de la Disposición y Tratamiento de Desechos Municipales", Seminario-Taller; Ministerio de Desarrollo Sostenible, La Paz (1996).
Pichot, A. (1995), "For National Accounts Extended to Sociodemographic and Environmental Data", *Annali di Statistica*, X(6):257-283.
Pyatt, G. (1990), "Accounting for Time Use", Review of Income and Wealth, Series 36, No. 1.
------ (1994) " Accounting for Homo Oeconomicus", Siena Conference in Memory of Sir Richard Stone, Certosa de Portigiano, Siena.
Pyatt, G. and E. Thorbecke (1976), *Planning Techniques for a Better Future*, Geneva: ILO.
Pyatt, G., A. Roe and Associates (1977) *Social Accounting for Development Planning: With Special Reference to Sri Lanka*. Cambridge University Press.
Pyatt, G., and J.I. Round (1979) "Accounting and Fixed Price Multipliers in a Social Accounting Matrix Framework", *Economic Journal*, Vol. 89, No. 356, pp. 850-873.
Robinson, Sh., (1989), Multisectoral Models, Chapter 18. in *Handbook of Development Economics*, Vol. II, Elsevier Science Publishers B.V.
Romero, S. (1996-A), "Emisiones de Gases de Efecto Invernadero de Sector Agrícola en Bolivia", Seminario-Taller; Ministerio de Desarrollo Sostenible, La Paz (1996).
------, (1996-B) "Emisiones de Gases Efecto Invenadero del Sector Cambio en el Uso de la Tierra", Seminario-Taller; Ministerio de Desarrollo Sostenible, La Paz (1996).
Stahmer, C. (1995), "System of Integrated Environmental and Economic Accounting" en Social Statistics, *National Accounts and Economic Analysis*, International Conference in Memory of Sir R. Stone, Siena, Italy, Instituto Nazionale di Stadistica.
Streeten, P. and P. Burki, 1978, *Basic Needs, Some Issues*, University Press, Oxford.
Taylor, L. (1979), Macro-Economic Models for Development Countries", McGraw-Hill, N.Y.
Taylor, L. (1983), *Structuralist Macroeconomics*, New york: Basic Books.
Taylor, L. (1990), *Structuralist CGE Models for the Third World; Socially Policy Relevant Models*, Cambridge (Mass.), MIT Press.
Tejada, F (1996) "Emisiones de Efecto Invernadero del Sector Enérgetico Industrial en Bolivia: Seminario-Taller; Ministerio de Desarrollo Sostenible, La Paz (1996).
Thorbecke, E. (1992), "Adjustment and Equity in Indonesia",Development Centre of the Organization for Co-Operation and Development, Paris.

Turner, R. Kerry, David Pearce, and Ian Bateman (1994): *Environmental Economics: An Elementary Introduction*, Hemel Hempstead: Harvester Wheatsheaf.

UDAPE (1990), *Matríz de Contabilidad Social para la Evaluación Macroeconomica de la Inversión Pública*, La Paz: Unidad de Análisis de la Política Económica (Agosto 1990).

UDAPSO (1993), *Carpeta de Indicadores Sociales*, La Paz: Unidad de Análisis de la Políticas Sociales (Septiembre 1993).

UNEP (1993), *Environmental Data Report 1993/94*, Oxford: Blackwell Publishers.

UN (1975), *Towards a System of Social and Demograhpic Statistics*, Studies in Methods, Series F, 18, New York: United Nations.

UNSD (1993), *Integrated Environmental and Economic Accounting (Interim Version)*, Studies in Methods, Ser. F., nr. 61, New York.

Vos, R., (1988) *Government Policies, Inequality and Basis Needs in Ecuador*, in Teekens (eds) "Theory and Policy Design for Basic Needs Planing", Avebury Aldershot, USA, Cap. 13.

----- (1993), "Hacia un Sistema de Indicadores Sociales para América Latina", *Planes de Desarollo - Sistemas de Seguimento y Evaluación*, Memorias del Seminario Taller International " Sistemas de Seguimento y Evaluación de Planes y Programas de Desarollo", Santafé de Bogotá: DNP/CID/Secretaria de Información y de Sistemas de la Presidencia de la República.

WCED (1987), *Our Common Future*, New York: Oxford University Press.

BOX 1

Bolivia: Selective List of Indicators

Environmental

Land use: 3% arable permanent farming; 25% valleys and pastures; 52% forest and woodland; 20% other
High plateau: exhausted land, with signs of erosion and desertification due to intensive cultivation Cold climate, oxygen scarcity an obstacle for efficient combustion
Forest and woodland: humid semi-tropical and tropical climates
Deforestation: annually 1.1%.(*)
Waste, car noise and other types of pollution in major urban centres

Demographic and Standard of Living Indicators

Population: 6,420,792 (census 1992), growth rate 2.1% (1990)
Density: 5.84 (1992)
Ethnicity: 30% Quechua, 25% Aymara, 25-30% creole, 5-15% european
Literacy: Older than 6 years 81% (census 1992). Adults 23-29% (1990)(*)
Crude birth rate: 36/1,000 (1992)
Crude mortality: 9.7/1,000 (1992)
Infant mortality: 92/1,000 born alive (1992)
Life expectancy at birth: men 52 years and women 56 years (1990)
Total fertility: 5.0 children\woman (1992)
Malnutrition; under 5 years of age 11.4% (*)
Doctor\population: 2020 (1970) and 1,538 (1992)
Teacher\student: 25 (1991) (*)
Incidence of poverty (1992)
- Country: 69.8% (households), 70.5% (population)
- urban: 51.1% (households), 52.5% (population)
- rural: 94.0% (households), 95.1% (population)

Health: access 33% of the population.
Social Security: access 10% of total population.
Schooling Averages:
- Country: 3.7 years
- Urban: 6.3 years
- Rural: 1.0 year

Water: access 64% of the housing sector. Urban 70% and rural 30% (1990)(*)
Electricity: reaches one third of the urban sector and two thirds rural sector.
Urban areas housing: 50% has access to sanitary services, 40% do not have kitchen and 92% do not have shower.
Sanitation: reaches 13% (1970) and 26 (1993) of total population(*)

Economic Indicators

PIB: $US 5,23 billions, per capita 817 US$ (1989)
Inflation (C.P.I.): 11,700 (1985); 15.5% (1989)
Labour force: 2,530,409; 41% agriculture, 32% services and utilities, 9% manufactures, 2% mining, 18% rest (1992)
Unemployment rates: open and visible under-employment: 20.7% (1992)
Exchange rates: Bolivianos/US$: (1992) 5.07; 2.69 (1989), 0.44 (1985).

Sources: Population Census 1992; UDAPSO "Indicadores Sociales" (Septiembre 1992); Chávez Alvarez and Toranzo (1993), "Claves y problems de la Económica Boliviana", ILDIS, La Paz. Muñoz (1994) extracted from INE and Banco Central de Bolivia. (*) World Development Report 1994: Infrastructure for Development; World Bank, Oxford University Press

Table 1: Schematic Social Accounting Matrix for Bolivia 1989

(file:schbosam.xls)

EXPENDITURES / INCOMES	PRODUCT. ACT. 1 - PA	COMMODITIES 2 - CM	FACTOR of PRODU 3 - FP	OTHER INSTITUTION 4 - OI	HOUSEHOLDS 5 - HH	WANTS\BASIC NEED 6 - BN	REST WORLD 7 - RW	CONSO. CAPITAL 8 -KA	TOTAL INCOME
1-PA- PRODUCTION ACTIVITIES		Supply National Origin T 1,2 27453.7							TOTAL DEMAND at producer's prices 27453.7
2-CM- COMMODITIES	Intermediate Demand T 2,1 12093.1	Trade margins T 2,2 346.9		Government Consumption T 2,4 1619.9		Household Wants conversion T 2,6 10140.5	Exports:Goods \Serv. T 2,7 4732.7	Gross Capital Formation T 2,8 1695.2	TOTAL FINAL DEMAND at market prices 30628.3
3-FP- FACTORS OF PRODUCTION	Factor Income Payments T 3,1 14087.0								INCOME OF DOMESTIC PRODUCTION FACTORS 14087.0
4-OI- OTHER INSTITUTIONS	Net Indirect Taxes T 4,1 1273.6	Import Duties T 4,2 162.3	Net Indirect Taxes T 4,3 162.9		Direct Taxes T 4,5 859.9		Income from abroad T 4,7 367.9		INCOME OF OTHER INSTITUTIONS 2826.6
5-HH- HOUSEHOLDS			Factor Input Income T 5,3 12512.6	Transfers to Households T 5,4 244.7					DISPOSABLE INCOME OF HOUSEHOLDS 12757.3
6-BN- Basic Needs \WANTS					Household Consumption T 6,5 10140.5				TOTAL CONSUMER BASIC NEEDS\WANTS 10140.5
7-RW- REST OF WORLD		Imports of Good \Serv. T 7,2 2665.3	Factor Income to Abroad T 7,3 1411.5	Income to Abroad T 7,4 609.3					TOTAL CURRENT PAYMENTS TO ABROAD 4686.1
8-KA- CAPITAL CONSOLIDATED				Savings Public Priv. Inst. T 8,4 352.7	Households Savings T 8,5 1757.0		Foreign Savings T 8,7 -414.5		TOTAL SAVINGS 1695.2
TOTAL EXPENDITURES	GROSS VALUE OF OUTPUT (pp) at p.p. 27453.7	TOTAL SUPPLY at m.p. GOODS\WANTS 30628.2	OUTLAYS OF DOMESTIC FACTOR INPUTS 14087.0	OUTLAYS OF OTHER INSTIT. 2826.6	OUTLAYS OF HOUSEHOLDS 12757.4	SUPPLY OF WANTS 10140.5	TOTAL FOREIGN Curr. Income 4686.1	Total Gross INVESTMENTS 1695.2	
No. of employees\households	2021.5		2021.5		1518.0	1518.0			
Average Incomes	13.58		6.97		8.40	6.68			

Source: Aggregated from the Adapted SAM built by UDAPE (1990); see Annex 1

Table 2: Schematic Extended SAM for Bolivia - 1989

	Outlays												
Incomings	1-PA	2-CM	3-FP	4-OI	5-HH	6-BN	7-RW	8-KA	TOTAL	9-SI	10-SA	SB	TE
1-PA		$T_{1,2}$							Y_1		$I_{1,10}$		
2-CM	$T_{2,1}$	$T_{2,2}$		$T_{2,4}$		$T_{2,6}$	$T_{2,7}$	$T_{2,8}$	Y_2	$I_{2,9}$			
3-FP	$T_{3,1}$								Y_3				
4-OI	$T_{4,1}$	$T_{4,2}$	$T_{4,3}$		$T_{4,5}$		$T_{4,7}$		Y_4				
5-HH			$T_{5,3}$	$T_{5,4}$					Y_5	$I_{5,9}$			
6-BN					$T_{6,5}$				Y_6	$I_{6,9}$	$I_{6,10}$		
7-RW		$T_{7,2}$	$T_{7,3}$	$T_{7,4}$					Y_7		$I_{7,10}$		
8-KA				$T_{8,4}$	$T_{8,5}$		$T_{8,7}$		Y_8		$I_{8,10}$		
TOTAL	E_1	E_2	E_3	E_4	E_5	E_6	E_7	E_8					
9-SI					$I_{9,5}$								
10-SA	$I_{10,1}$						$I_{10,7}$					SB	TE
TE											TS		

Symbols: PA = production activities; CM = commodities; FP = factors of production; OI = other institutions; HH = households; BN = basic needs; RW = rest of the world; KA = consolidated capital account; Y = total income; E = Total expenditure; SI = physical socioeconomic indicators account; SA = physical substances indicators account; SB = balance of substances; TS = total supply of substances; TE = total environment

Source: See Table 1

TABLE 3: AGGREGATE EXTENDED SAM (ESAM) WITH SOCIAL INDICATORS

	1.1 PA	1.2 PA	1.3 PA	1.4 PA	1.5 PA	1.6 PA	1.7 PA	2 CM	3 FP	4 OI	5 HH URBAN HIGH	5 HH URBAN MEDIUM	5 HH URBAN LOW	5 HH RURAL	6 BN	7 RW	8 KA	GRAND TOTAL	9 SI POP.	9 SI INCR. POP.	9 SI STOCK URBAN	9 SI STOCK RURAL	9 SI TOTAL	9 SI INCR. URBAN	9 SI STOCK RURAL	9 SI TOTAL	10 SA ENVIRO MENT	88 BAL OF SUBST.
1.1 PA FOOD PRODUCTION ACTIVITIES																												
1.1 PA AGRICULTURE TRADITIONAL																												
1.2 PA AGRICULTURE MODERN																												
1.3 PA HYDROCARBON NAT GAS																												
1.4 PA MANUFACTURES																												
1.5 PA ELECTRICITY																												
1.6 PA TRANSPORT																												
1.7 PA MODERN SERVICES/OTHER																												
2 CM COMMODITIES																			6034916	123401	806245	782599	1588844	20660	19541	40202		
3 FP FACTORS OF PRODUCTION																												
4 OI OTHER INSTITUTIONS																												
5 HH HOUSEHOLDS																												
6 BN BASIC NEEDS																		12757362										
HOUSING											118327	363885	254605	119000														
TOTAL BASIC NEEDS																												
7 RW REST OF THE WORLD																		10140473										
8 KA CONSOLIDATED CAPITAL																												
GRAND TOTAL																												
9 SI SOCIAL INDICATORS																												
POPULATION											110258	1475523	1857126	2718723				5961630										
GROWTH OF POPULATION																												
NUMBER OF HOUSEHOLDS											24536	328362	368775	636311				1357984										
INCREASE IN # OF HOUSEHOLDS																												
HOUSING																												
NUMBER OF																												
HOUSES OWNED BY OCCUPANTS											14186	195508	209896	NA				419590										
INDEPENDENT HOUSES											16169	213763	229747	518292				977971										
DEPARTMENTS											2331	19059	28026	1545				49961										
SINGLE ROOM DWELLINGS											5790	90627	103257	26176				225850										
ROOMS (IN HOUSE, APARTMENT, ETC.)											93940	1002483	1142324	NA				2238747										
BEDROOMS (EXCL. FOR SLEEPING)											48785	489074	558763	NA				1096622										
NUMBER OF PEOPLE LIVING IN																												
OWN HOUSE											69132	934006	989304	NA				1992442										
SAFE HOUSE											99563	1205502	1362157	551901				3219123										
HOUSE WITH SAFE WATER											106849	1356006	1556041	2085260				5103156										
HOUSE WITH SANITARY FACILITIES											71227	615293	848448	791148				2326116										
HOUSE WITH SEPARATE KITCHEN											94822	1149432	1294215	NA				2538469										
HOUSE WITHOUT BEDROOM (SPECIAL ROOM)											81956	1305845	1570955	NA				3058756										
INDEPENDENT HOUSE											77512	1010733	1095360	2211347				4394952										
DEPARTMENT											9923	72300	112084	7120				202027										
SEPARATE ROOMS											21941	364454	400310	110101				905806										
10 SA ENVIRONMENTAL INDICAT																												TE
																											TS	

Notes: NA means not available

Sources: INE (1990), UDAPE (1990) UDAPSO (1993), INE (1995), Burger and Prachan (1996)

TABLE 4: SCHEMATIC EXTENDED SAM (ESAM) WITH ENVIRONMENTAL INDICATORS (file: ICLT4ENG.xls)

	1.1-PA AGRIC.. TRADITI	1.2-PA AGRIC.. MODER	1.3-PA MINING	1.4-PA MANUF TURES	1.5-PA TRANS- PORT	1.6-PA MODER SERV.\O	2-CM COMMO ITIES	3-FP FRACTO PRODUC	4-OI OTHER INSTITU	5-HH HOUSEH	6-BN BASIC NEEDS	7-RW REST OF THE WORLD	8-KA CONSOL CAPITA	GRAND TOTAL	9-SI-SYSTEM OF SOCIAL INDICATORS	10-SA-ENVIRONMENTAL INDICATORS EMISSIONS IN GIGA-GRAMMS (Gg) CO2	CH4	CO	OTHER	WASTE	T Joules NATURAL GAS	T Joules PETRO- LEUM	BS-BALANCE OF SUBSTANCES	
1 PA PODUCTION ACTIVITIES																							
1.1 PA AGRICULTURE TRADITIONAL																61.1	0	0	0	(0)	-	-	
1.2 PA AGRICULTRE MODERN																76266	572.11	1088.69	600.81	(0)	-	-	
1.3 PA MINING																6702.65	13.93	0	0	(0)	(0)	(0)	
1.4 PA MANUFACTURES																1594.2	0.06	0.43	2.5	(0)	-	-	
1.5 PA ELECTRICITY																1309.39	0.11	11.03	2.97	(0)	-	-	
1.6 PA TRANSPORT																2239.88	0.76	182.19	43.17	(0)	-	-	
1.7 PA MODERN SERVICES\OTHER																0	10.8	0	0	(0)	-	-	
2 CM COMMODITIES																							
3 FP FACTORS OF PRODUCTION																							
4 OI OTHER INSTITUTIONS																							
5 HH HOUSEHOLDS																							
6 BN BASIC NEEDS																(0)	(0)	(0)	(0)	(0)	-	-	
7 RW REST OF THE WORLD																(0)	(0)	(0)	(0)	(0)	-	-	
8 KA CONSOLIDATED CAPITAL																-	-	-	-	-	(0)	(0)	
GRAND TOTAL																							
9 SI SOCIAL INDICATORS																							

10 SA ENVIRONMENTAL INDICATORS	DEPLETION OF NATURAL ASSETS						EXPORT OF			BS-BALANCE	TE-DESTINATION
SUBSTANCES							SUBSTANCES			SUBSTANCES	of SUBSTANCES
CO2	-	-	-	-	-	-	(0)			98163.21	98163.21
CH4	-	-	-	-	-	-	(0)			597.76	597.76
CO	-	-	-	-	-	-	(0)			1282.34	1282.34
OTHER	-	-	-	-	-	-	(0)			649.45	649.45
WASTE	-	-	-	-	-	-	(0)			0	0
NATURAL GAS	-	-	140644	-	-	-	-			-140644	0
PETROLEUM	-	-	49579	-	-	-	-			-49579	0
							-				

	TS- SUPPLY OF SUBSTANCES						
Notes: (0) means absence of data; (-) not applicable	98163.2	597.76	1282.34	649.45	0	0	0
Source: See table 6A and 6B							

Table 5: Classification of Urban Households

Household group for the SAM for 1989	CATEGORY OCCUPATION OF THE HOUSEHOLD HEAD	OCCUPATION OF THE HOUSEHOLD HEAD EIH89
Income high	Capitalist	employer, employee or partner (except those in agriculture)
Income middle	Small producer	Employer, employee or partner in agriculture; own account worker and independent professional
	Salaried skilled	Labourer or employee in mining, manufacturers, electricity, gas y water, finances and insurance
Income low	Salary earner non-skilled	Labourer o employee in agriculture, construction, commerce, transport and storage, personal services
	Not-classified elsewhere	Household Employee, family labourer or apprentice without remuneration, or unemployed head

Table 6A: Environmental Data for Bolivia-1990: Green House Effect Gases (GHEG) of Anthropogenic Origin (File:ICL6ABEN.xls)										ESAM-Bolivia
1-Use of Combustibles in Gg	CO	CH4	NOx	N2O	NMVOC	CO2	C	Total Gg	Cunsumption-Tj	Polluting sector
Source Mobile Type-Transport	182.19	0.76	18.60	0.05	24.52	2239.88		2466.00	NA	Modern Services
Source Stationary Type: Energy and Transformation	0.36	0.06	2.10	0.00	0.00	712.72		715.25	12248.71	Electricity
Manufacture	0.43	0.05	2.50	0.00	0.00	1594.20		1597.18	17607.40	Manufactures
Commercial, Public and Residential	10.67	0.05	0.72	0.15	0.00	596.67		608.25	29227.09	Electricity
Source Fugitive Type: System of Petroleum and Natural Gas	0.00	13.93	0.00	0.00	0.00	779.69		793.62		Hidrocarbon-N.Gas
Total by Source Type	193.65	14.85	23.92	0.20	24.52	5923.16		6180.30	59083.20	
Structure by Type of Source (%)	CO	CH4	NOx	N2O	NMVOC	CO2	C	total		Polluting sector
Source Mobile Type-Transport	94.08	5.12	77.77	25.00	100.00	37.82		39.90	NA	Modern Services
Source Stationary Type: Energy and Transformation	0.19	0.42	8.78	0.00	0.00	12.03		11.57	20.73	Electricity
Manufacture	0.22	0.32	10.45	0.00	0.00	26.91		25.84	29.80	Manufactures
Commercial, Public and Residential	5.51	0.32	2.99	75.00	0.00	10.07		9.84	49.47	Electricity
Source Fugitive Type: System of Petroleum and Natural Gas	0.00	93.82	0.00	0.00	0.00	13.16		12.84	0.00	Petroleum-Natural
Total by Source Type	100.00	100.00	100.00	100.00	100.00	100.00		100.00	100.00	
2- Agriculture and Livestock in Gg	CO	CH4	NOx	N2O	NMVOC	CO2	C	Total		Modern
Livestock		415.30						415.30		Agriculture
Dung		13.24						13.24		id
Rice Production		25.65						25.65		id
Savannah Burning	76.96	2.93	1.31	0.04	0.00		549.75	630.99		id
Total	76.96	457.12	1.31	0.04	0.00		549.75	1085.18		
Structure: Changes in Agriculture-Livestock %	CO	CH4	NOx	N2O	NMVOC	CO2	C	Total		
Livestock		90.85						38.27		Modern
Dung		2.90						1.22		Agriculture
Rice Production		5.61						2.36		id
Savannah Burning	100.00	0.64	100.00	100.00	0.00	0.00	100.00	58.15		id
Total	100.00	100.00	100.00	100.00	0.00	0.00	100.00	100.00		
3-Clearing of Forestry in Gg	CO	CH4	NOx	N2O	NMVOC	CO2	C	Total		Modern
Burning of woods in situ	1002.24	114.54	28.46	0.79	0.00	50006.72	0.00	51152.75		Agriculture
changes in land %	1.96	0.22	0.06	0.00	0.00	97.76	0.00	100.00		
4-Changes in Land, biomass and burning of waste in Gg	CO	CH4	NOx	N2O	NMVOC	CO2	C	Total		
Burning of Waste	9.49	0.45	0.75	0.02	0.00	0.00	0.00	10.71		Modern
Logging of Biomass						26249.27		26249.27		Agriculture
Abandoning of Culture Land							19.69	19.69		id
Total	9.49	0.45	0.75	0.02	0.00	26249.27	19.69	26279.67		
Structure: Land and Waste	CO	CH4	NOx	N2O	NMVOC	CO2	C	Total		
Burning of Waste	100.00	100.00	100.00	100.00	0.00	0.00	0.00	0.04		
Logging of Biomass	0.00	0.00	0.00	0.00	0.00	100.00	0.00	99.88		
Abandoning of Culture Land	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.07		
total	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00		
5- Treatment : Sanitary Waste	0.00	1.11	0.00	0.00	0.00	0.00	0.00	1.11		Modern Public Serv
Water	0.00	9.69	0.00	0.00	0.00	0.00	0.00	9.69		id
6- Production of Gas, Petroleum and Biomass in Gg	CO	CH4	NOx	N2O	NMVOC	CO2	C	Total	Production Tj	
Production of Natural Gas						2398.87		2398.87	140544.00	Natural Gas
Production of Petroleum						3524.09		3524.09	48579.00	Petroleum
Generation of Biomass						61.10		61.10		Traditional Agricu
Total						5984.06		5984.06	189123.00	
Grand total Current GHEG in Gg	1282.34	597.76	54.43	1.05	24.52	88163.21	569.44	90692.75		

Table 6B: Environmental Data for SAM Bolivia-1990								
Allocation to Sectors in Gg: SAM Bolivia 1989	CO	CH4	NOx	N2O	NMVOC	CO2	C	TOTAL
Modern Agriculture	1088.69	571.11	30.52	0.85	0.00	76255.99	569.44	78517.59
Traditional Agriculture-Generation of biomass	0.00	0.00	0.00	0.00	0.00	61.10	0.00	61.10
Modern Services: Transport	182.19	0.76	18.60	0.05	24.52	2239.88	0.00	2466.00
Electricity and Energy	11.03	0.11	2.82	0.15	0.00	1309.39	0.00	1323.50
Manufacture	0.43	0.05	2.50	0.00	0.00	1594.20	0.00	1597.18
Modern: Public Services	0.00	10.80	0.00	0.00	0.00	0.00	0.00	10.80
Petroleum and Natural Gas	0.00	13.93	0.00	0.00	0.00	6702.65	0.00	6716.58
Total GHEG Current Emissions	1282.34	597.76	54.43	1.05	24.52	88163.21	569.44	90692.75
Structure of Sectorial Allocation of Emissions in Gg (%)	CO	CH4	NOx	N2O	NMVOC	CO2	C	TOTAL
Modern Agriculture	84.90	95.71	56.06	80.90	0.00	86.49	100.00	86.58
Traditional Agriculture-Generation of biomass	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.07
Modern Services: Transport	14.21	0.13	34.17	4.76	100.00	2.54	0.00	2.72
Electricity and Energy	0.86	0.02	5.17	14.33	0.00	1.49	0.00	1.46
Manufacture	0.03	0.01	4.59	0.00	0.00	1.81	0.00	1.76
Modern: Public Services	0.00	1.81	0.00	0.00	0.00	0.00	0.00	0.01
Petroleum and Natural Gas	0.00	2.33	0.00	0.00	0.00	7.60	0.00	7.41
Shares: Total GHEG Emissions	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Shares Rowwise: Total GHEG Emissions [illegible]	1.41	0.66	0.06	0.00	0.03	97.21	0.63	100.00

Source: Summaries of Papers presented to the Workshop Seminar 1990, La Paz Bolivia:

Papers 1=Tejada; 2=Romero; [illegible]

Symbols: CO = carbon monoxide, CH4 = Methane gas, [illegible]

NMVOC = Non-methane volatile compounds [illegible]

TABLE A.1: BOLIVIA 1989 - EXTENDED SOCIAL ACCOUNTING MATRIX (MILES DE BOLIVIANOS)

	(File:SAMB089E.xls)	1-PA	2-PA	3-PA	4-PA	5-PA	6-PA	7-PA	8-PA
CODES	INCOMES/EXPENDITURES								
1-PA	AGRICULTURE TRADITIONAL								
2-PA	AGRICULTURE MODERN								
3-PA	COCA								
4-PA	MINING								
5-PA	HYDROCARBONS, NATURAL GAS								
6-PA	MANUFACTURES								
7-PA	ELECTRICITY-WATER								
8-PA	CONSTRUCTION								
9-PA	SERVICES -MODERN								
10-PA	SERVICES-INFORMAL								
11-PA	SERVICES-PUBLIC								
TOTAL-PA	TOTAL PRODUCTIVE ACTIVITIES								
12-CM	AGRICULTURE -TRADITIONAL	332796	32927	0	65927	0	335939	0	0
13-CM	AGRICULTURE-MODERN	35197	3482	0	6444	0	525343	0	747
14-CM	COCA	0	0	1568908	0	0	0	0	0
15-CM	MINING	0	0	0	52958	0	8301	0	7957
16-CM	HYDROCARBONS, NATURAL GAS	8600	11627	36658	48842	349282	174411	25531	588
17-CM	MANUFACTURES	18602	25151	186867	86510	12564	1190805	15399	266433
18-CM	ELECTRICITY-WATER	93	125	2451	211973	7186	114169	1203	933
19-CM	CONSTRUCTION AND PUB. WORKS	934	1263	898	14007	18016	6679	4357	0
20-CM	SERVICES-MODERN	15714	21245	11823	220667	316858	295890	10855	36240
21-CM	SERVICES-INFORMAL	0	0	0	0	0	0	0	0
22-CM	SERVICES-PUBLIC AND OTHER	0	0	0	0	0	0	0	0
23-CM	IMPORTS OF INPUTS	14440	19523	35395	79509	10706	316953	3597	70994
24-CM	MARGINS- TRADE AND TRANSPORT	804805	217717	0	2651	3744	505861	0	0
TOTAL-CM	TOTAL COMMODITIES	1231181	333060	1843000	789488	718356	3474351	60942	383892
25-FP	ENTERPRISES-PUBLIC	0	0	0	3821	85618	27024	18977	0
26-FP	CAPITALISTS	0	577776	1409600	307562	0	545055	8133	221137
27-FP	CAMPESINOS	1822682	0	525558	0	0	0	0	0
28-FP	SMALL PRODUCERS	0	0	0	178338	0	1142184	0	404973
29-FP	SALARY EARNERS-SKILLED	0	0	0	103620	209036	107460	341004	59546
30-FP	SALARY EARNERS-NON SKILLED	0	134649	58642	158890	18755	281496	29043	187508
31-FP	LABORERS-INFORMAL	0	0	0	0	0	0	0	0
TOTAL-FP	TOTAL FACTORIAL INCOMES	1822682	712425	1993800	752231	313409	2103219	397157	873164
32-OI	TAXES-INDIRECT	0	2756	0	13074	757859	157977	21894	4829
33-OI	TAXE-TRADE\IMPORT DUTIES	0	0	0	0	0	0	0	0
34-OI	TAXES-DIRECT								
35-OI	ENTERPRISES-PUBLIC								
TOTAL-OI	TOTAL OTHER INSTITUTIONS	0	2756	0	13074	757859	157977	21894	4829
36-HH	HOUSEHOLDS URBAN HIGH-INCOMES								
37-HH	HOUSEHOLDS URBAN MIDDEL-INCOMES								
38-HH	HOUSEHOLDS URBAN LOW-INCOMES								
39-HH	HOUSEHOLDS-RURAL								
TOTAL-HH	TOTAL HOUSEHOLDS								
40-BN	FOOD								
41-BN	GARMENTS								
42-BN	HOUSING								
43-BN	HEALTH Y EDUCATION								
44-BN	CONSUMPTION-DURABLES								
45-BN	TRANSPORT								
46-BN	SERVICES-PERSONAL								
TOTAL-BN	TOTAL NECESSITIES								
47-RW	REST OF THE WORLD COMMODITIES								
48-RW	REST OF THE WORLD INCOMES								
TOTAL-RW	TOTAL REST OF THE WORLD								
49-KF	CONSOLIDATED CAPITAL ACCOUN.								
TOTAL	TOTAL EXPENDITURES	3053863	1048241	3836800	1554793	1789624	5735547	479993	1261885
Labels	INCOMES EXPENDITURES	1-FA	2-FA	3-FA	4-FA	5-FA	6-FA	7-FA	8-FA
50.1-SI	EMPLOYMENT/FACTORS/HOUSEHOLDS	733131	52204	80088	53664	10436	178106	18881	110087
50.2-SI	AVERAGE INCOME	4166	20080	47908	28973	171486	32203	25422	11463
50.3-SI	POPULATION (NUMBER OF PERSONS)								
50.4-SI	AVERAGE HOUSEHOLD SIZE								
50.5-SI	No. HOUSES OWNED BY OCCUPANTS								
50.6-SI	No. of INDEPENDENT HOUSES								
50.7-SI	No. of APARTMENTS								
50.8-SI	No. of SIGLE ROOM DWELLINGS								
50.9-SI	No. of ROOMS (IN HOUSES, APART., ETC.)								
50.10-SI	No. of Houses with EXCLUSIVE BEDROOM								
50.11-SI	No. OF PERSONS IN OWN HOUSE								
50.12-SI	No. OF PERSONS IN SAFE HOUSE								
50.13-SI	No. OF PERSONS\HOUSE WITH SAFE WATER								
50.14-SI	No. OF PERSONS\HOUSE WITH SANITARY FACILITIES								
50.15-SI	No. OF PERSONS\HOUSE WITH SEPARATE KITCHEN								
50.16-SI	No. OF PERSONS IN HOUSE WITHOUT EXCLUSIVE BEDROOM								
50.17-SI	No. OF PERSONS IN INDEPENDENT HOUSE								
50.18-SI	No. OF PERSONS IN APARTMENT								
50.19-SI	No. OF PERSONS IN SIGLE-ROOM DWELLINGS								

SA-ENVIRONMENTAL INITIATIVES		REPETITIONS
51.1-SA	PET	-
51.2-SA	CH4	-
51.3-SA	CO	-
51.4-SA	OTHER	-
51.5-SA	WASTE	-
51.6-SA	NATURAL GAS	143544
51.7-SA	PETROLEUM	48578

SOURCE: UDAPE (1997), "Matriz de Contabilidad Social 1989 de Bolivia", Unidad de Análisis de Políticas Económicas, Ministerio de Hacienda, La Paz.

TABLE A.	9-PA	10-PA	11-PA	TOTAL-PA	12-CM	13-CM	14-CM	15-CM	16-CM	17-CM	18-CM	19-CM
CODES												
1-PA					3053863							
2-PA						1048241						
3-PA							3836800					
4-PA								1554793				
5-PA									1789624			
6-PA										5735547		
7-PA											479993	
8-PA												1261885
9-PA												
10-PA												
11-PA												
TOTAL-PA					3053863	1048241	3836800	1554793	1789624	5735547	479993	1261885
12-CM	11508	1173	10873	791143								
13-CM	17997	1834	17004	608048								
14-CM	0	0	0	1568908								
15-CM	1018	104	0	70338								
16-CM	240145	26841	94809	1017334								
17-CM	405729	44398	336361	2588819								
18-CM	58476	12240	13374	422223								
19-CM	231535	23857	43322	344868								
20-CM	928398	292180	157394	2307264								
21-CM	0	0	0	0								
22-CM	0	0	0	0								
23-CM	179968	28174	80097	839356								
24-CM	0	0	0	1534778	0	279	0	0	0	125693	0	0
TOTAL-CM	2074774	430801	753234	12093079	0	279	0	0	0	125693	0	0
25-FP	27507	0	0	162947								
26-FP	902120	0	0	3971383								
27-FP	0	0	0	2348240								
28-FP	1024828	0	0	2750323								
29-FP	785550	0	713250	2319466								
30-FP	792093	0	200864	1861940								
31-FP	0	672736	0	672736								
TOTAL-FP	3532098	672736	914114	14087035								
32-OI	234355	80847	0	1273591		0	0	0	35	3010	0	0
33-OI	0	0	0	0		246	0	0	135	64366	0	0
34-OI												
35-OI												
TOTAL-OI	234355	80847	0	1273591		246	0	0	170	67376	0	0
36-HH												
37-HH												
38-HH												
39-HH												
TOTAL-HH												
40-BN												
41-BN												
42-BN												
43-BN												
44-BN												
45-BN												
46-BN												
TOTAL-BN												
47-RW					0	9530	0	0	17364	1222908	47	0
48-RW												
TOTAL-RW					0	9530	0	0	17364	1222908	47	0
49-[illegible]												
TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	3053863	1058296	3836800	1554793	1807158	7151524	480040	1261885
Labels	9-PA	10-PA	11-PA	TOTAL-PA	12-CM	13-CM	14-CM	15-CM	16-CM	17-CM	18-CM	19-CM
50.1-SI	[illegible]	[illegible]	[illegible]	[illegible]								
50.2-SI	22141	3312	10228	13584								
50.3-SI												
50.4-SI												
50.5-SI												
50.6-SI												
50.7-SI												
50.8-SI												
50.9-SI												
50.10-SI												
50.11-SI												
50.12-SI												
50.13-SI												
50.14-SI												
50.15-SI												
50.16-SI												
50.17-SI												
50.18-SI												
50.19-SI												
SA-ENT[illegible]												
51.1-SA												
51.2-SA												
51.3-SA												
51.4-SA												
51.5-SA												
51.6-SA												
51.7-SA												

SOURCE: [illegible]

TABLE A.

	20-CM	21-CM	22-CM	23-CM	24-CM	TOTAL-CM	FP-25	26-FP	27-FP	28-FP	29-FP	30-FP
CODES												
1-PA					0	3053863						
2-PA					0	1046241						
3-PA					0	3836800						
4-PA					0	1554793						
5-PA					0	1789624						
6-PA					0	5735547						
7-PA					0	479993						
8-PA					0	1261885						
9-PA	4647724				1193503	5841227						
10-PA		496169			688215	1184384						
11-PA			1667348		0	1667348						
TOTAL-PA	4647724	496169	1667348	0	1881718	27453705						
12-CM												
13-CM												
14-CM												
15-CM												
16-CM												
17-CM												
18-CM												
19-CM												
20-CM												
21-CM												
22-CM												
23-CM												
24-CM	0	0	0	220968		346940						
TOTAL-CM	0	0	0	220968	0	346940						
25-FP												
26-FP												
27-FP												
28-FP												
29-FP												
30-FP												
31-FP												
TOTAL-FP												
32-CI	0	0	0	7863	0	10908						
33-CI	0	0	0	86647	0	151394						
34-CI												
35-CI							162947					
TOTAL-CI	0	0	0	94510	0	162302	162947					
36-HH							0	2559914	0	0	0	0
37-HH							0		0	2750323	2319466	0
38-HH							0		0	0	0	1668649
39-HH							0		2346240	0	0	193291
TOTAL-HH							0	2559914	2348240	2750323	2319466	1861940
40-BN												
41-BN												
42-BN												
43-BN												
44-BN												
45-BN												
46-BN												
TOTAL-BN												
47-RW	1180388	0	0	1090441	0	2665348						
48-RW						0	0	1411469	0	0	0	0
TOTAL-RW	1180388	0	0	1090441	0	2665348		1411469				
49-TP												
TOTAL	5828112	496169	1667348	1405919	1881718	31328295	162947	3971383	2348240	2750323	2319466	1861940
Labels	20-CM	21-CM	22-CM	23-CM	24-CM	TOTAL-CM	FP-25	26-FP	27-FP	28-FP	29-FP	30-FP
50.1-SI								20225	803131	259701	228389	354468
50.2-SI								196360	2924	10590	12245	5253
50.3-SI												
50.4-SI												
50.5-SI												
50.6-SI												
50.7-SI												
50.8-SI												
50.9-SI												
50.10-SI												
50.11-SI												
50.12-SI												
50.13-SI												
50.14-SI												
50.15-SI												
50.16-SI												
50.17-SI												
50.18-SI												
50.19-SI												
SA-BN.1-1												
51.1-SN												
51.2-FN												
51.3-SN												
51.4-SI												
51.5-SN												
51.6-SN												
51.7-SN												
51.8-SI												
51.9-SI												
SOURCE												

TABLE A.

	31-FP	TOTAL-FP	32&33-OI	34&35-O	TOTAL-OI	36-HH	37-HH	38-HH	39-HH	TOTAL-HH	40-BN	41-BN
CODES												
1-PA												
2-PA												
3-PA												
4-PA												
5-PA												
6-PA												
7-PA												
8-PA												
9-PA												
10-PA												
11-PA												
TOTAL-PA												
12-CM											2325131	0
13-CM											251726	0
14-CM											99592	0
15-CM											0	0
16-CM											0	0
17-CM											1953092	899000
18-CM											0	0
19-CM											0	0
20-CM											225000	0
21-CM											250000	0
22-CM			1619905	0	1619905						0	0
23-CM											0	0
24-CM											0	0
TOTAL-CM			1619905	0	1619905						5104541	899000
25-FP												
26-FP												
27-FP												
28-FP												
29-FP												
30-FP												
31-FP												
TOTAL-FP												
32-OI												
33-OI												
34-OI						269468	506979	83432	0	859879		
35-OI		162947										
TOTAL-OI		162947				269468	506979	83432	0	859879		
36-HH	0	2559914	0	0	0							
37-HH	0	5069789	2414	0	2414							
38-HH	672736	2341365	242329	0	242329							
39-HH	0	2541531	0	0	0							
TOTAL-HH	672736	12512619	244743	0	244743							
40-BN						434713	1990828	1228899	1450101	5104541		
41-BN						91000	335000	239000	234000	899000		
42-BN						118327	363865	254605	119000	855817		
43-BN						182000	416000	221000	96000	915000		
44-BN						119000	243000	150000	144000	656000		
45-BN						197000	459342	270000	293000	1219342		
46-BN						135000	206773	113000	36000	490773		
TOTAL-BN						1277040	4014828	2476504	2372101	10140473		
47-RW												
48-RW	0	1411469	609285		609285							
TOTAL-RW		1411469	609285	0	609285							
49-RA			[illegible]	16294	[illegible]	1013406	550396	23778	169430	1757010		
TOTAL	672736	[illegible]	[illegible]	16294	[illegible]	2559914	5072203	2583714	2541531	12757362	5104541	899000
Labels	31-FP	TOTAL-FP	32&33-OI	34&35-O	TOTAL-OI	36-HH	37-HH	38-HH	39-HH	TOTAL-HH	40-BN	41-BN
50.1-SI	[illegible]	2021488				24537	328362	368776	636312	1357987		
50.2-SI	1861	6969				104329	15447	7006	3994	9394		
50.3-SI						110259	1475523	1657126	2718723	5914718		
50.4-SI						4.5	4.5	4.5	4.3	4.4		
50.5-SI						14186	195508	209896	NA			
50.6-SI						16170	213764	229747	518292			
50.7-SI						2331	18060	28027	1546			
50.8-SI						5791	90628	103257	26176			
50.9-SI						93940	1002483	1142324	NA			
50.10-SI						48786	489074	558763	NA			
50.11-SI						69132	934006	989304	ND			
50.12-SI						99564	1205503	1362158	551901			
50.13-SI						105849	1356006	1556041	2085261			
50.14-SI						71227	615293	848449	791149			
50.15-SI						94823	1149433	1294215	NA			
50.16-SI						91956	1395845	1570956	NA			
50.17-SI						77511	1010733	1095360	2211347			
50.18-SI						9923	72301	112685	7120			
50.19-SI						21942	364454	409310	110101			
SA-ENTRY												
51.1-SA												
51.2-SA												
51.3-SA												
51.4-SA												
51.5-SA												
51.6-SA												
51.7-SA												
SOURCE												

TABLE A:

CODES	42-BN	43-BN	44-BN	45-BN	46-BN	TOTAL-BN	47-RW	48-KA	49-KA	TOTAL-KA	TOTAL INCO	50.1-SI
												TOTAL POP
1-PA											3053863	
2-PA											1048241	
3-PA											3836800	
4-PA											1554793	
5-PA											1789624	
6-PA											5735547	
7-PA											479993	
8-PA											1261885	
9-PA											5841227	
10-PA											1184384	
11-PA											1667348	
TOTAL-PA											27453705	
12-CM	50000	0	0	0	0	2375131	0	3582	-115993	-112411	3053863	
13-CM	5000	0	0	0	0	256726	285057	350	-91885	-91535	1058296	
14-CM	0	0	0	0	0	99592	2168300	0	0	0	3836800	
15-CM	0	0	0	0	0	0	1353887	113	130455	130568	1554793	
16-CM	2000	0	0	174342	0	176342	575665	0	37817	37817	1807158	
17-CM	10000	0	656000	734000	0	4252092	263410	7597	39606	47203	7151524	
18-CM	57817	0	0	0	0	57817	0	0	0	0	480040	
19-CM	0	0	0	0	0	0	0	917017	0	917017	1261885	
20-CM	731000	890000	0	311000	222161	2379161	86357	0	0	0	4772782	
21-CM	0	0	0	0	246169	496169	0	0	0	0	496169	
22-CM	0	25000	0	0	22443	47443	0	0	0	0	1667348	
23-CM	0	0	0	0	0	0	0	766563	0	766563	1605919	
24-CM	0	0	0	0	0	0	0				1881718	
TOTAL-CM	855817	915000	656000	1219342	490773	10140473	4732676	1695222	0	1695222	30628295	
25-FP											162947	
26-FP											3971383	
27-FP											2348240	
28-FP											2750323	
29-FP											2319466	
30-FP											1861940	
31-FP											672736	
TOTAL-FP											14087035	
32-CI											1284499	
33-CI											151394	
34-CI							367895				1227774	
35-CI											162947	
TOTAL-CI							367895				2826614	
36-HH											2559914	
37-HH											5072203	
38-HH											2583714	
39-HH											2541531	
TOTAL-HH											12757362	
40-BN											5104541	
41-BN											899000	
42-BN											855817	
43-BN											915000	
44-BN											656000	
45-BN											1219342	
46-BN											490773	
TOTAL-BN											10140473	
47-RW											2665348	
48-RW											2020754	
TOTAL-RW											4686102	
49-KA							-4.4469				1695222	
TOTAL	855817	915000	656000	1219342	490773	10140473	4666102	1695222	0	1695222	1047 4808	

Labels	42-BN	43-BN	44-BN	45-BN	46-BN	TOTAL-BN	47-RW	48-KA	49-KA	TOTAL-KA	TOTAL INCO	50.1-SI
50.1-SI												
50.2-SI												
50.3-SI												6034916
50.4-SI												
50.5-SI												
50.6-SI												
50.7-SI												
50.8-SI												
50.9-SI												
50.10-SI												
50.11-SI												
50.12-SI												
50.13-SI												
50.14-SI												
50.15-SI												
50.16-SI												
50.17-SI												
50.18-SI												
50.19-SI												

51-EXPORT	export emissions
51.1-SI	0
51.2-SI	0
51.3-SI	0
51.4-SI	0
51.5-SA	0
51.6-SI	
51.7-SA	
51.8-SI	

TABLE A. 1 - CONTINUED

	50.1-S1	50.3-S1	50.4-S	50.5-S1	50.6-S1	51.1-S1	51.2-S	51.3-SA	51.4-S	1.5-S	51.7-S	51.8-S	BS-BALANCE O	TE-DESTINAT
CODES	GROWTH	GROWTH	GROWTH	GROWTH	STOCK HO	EMI-CO2	EMI-CH	EMI-SS	EMI-OI	WASTE	NAT.GA	PETROL	SUBSTANCES	SUBSTANCES
1-PA						61	0.0	0.0	0.0	0				
2-PA						76256	572.1	1088.7	600.8	0				
3-PA						0	0.0	0.0	0.0	0				
4-PA						0	0.0	0.0	0.0	0	0	0		
5-PA						6703	13.93	0.0	0.0	0	0	0		
6-PA						1594	0.05	0.4	2.5	0				
7-PA						1309	0.11	11.0	3.0	0				
8-PA						0	0.0	0.0	0.0	0				
9-PA						2240	0.76	182.2	43.2	0				
10-PA						0	0.0	0.0	0.0	0				
11-PA						0	10.80	0.0	0.0	0				
TOTAL-PA						88163	597.8	1282.3	649.5	0				
12-CM														
13-CM														
14-CM														
15-CM														
16-CM														
17-CM														
18-CM														
19-CM														
20-CM														
21-CM														
22-CM														
23-CM														
24-CM														
TOTAL-CM			40202	2515	1568844									
25-FP														
26-FP														
27-FP														
28-FP														
29-FP														
30-FP														
31-FP														
TOTAL-FP														
32-OI														
33-OI														
34-OI														
35-OI														
TOTAL-OI														
36-HH														
37-HH														
38-HH														
39-HH														
TOTAL-HH														
40-BN						(0)	(0)	(0)	(0)	(0)				
41-BN						(0)	(0)	(0)	(0)	(0)				
42-BN						(0)	(0)	(0)	(0)	(0)				
43-BN						(0)	(0)	(0)	(0)	(0)				
44-BN						(0)	(0)	(0)	(0)	(0)				
45-BN						(0)	(0)	(0)	(0)	(0)				
46-BN						(0)	(0)	(0)	(0)	(0)				
TOTAL-BN						(0)	(0)	(0)	(0)	(0)				
47-RW						(0)	(0)	(0)	(0)	(0)				
48-RW						(0)	(0)	(0)	(0)	(0)				
TOTAL-RW						(0)	(0)	(0)	(0)	(0)				
49-RA						(0)	(0)	(0)	(0)	(0)	(0)	(0)		
TOTAL						(0)	(0)	(0)	(0)	(0)				

Labels	50.1-S1	50.3-S1	50.4-S	50.5-S1	50.6-S1	51.1-S1	51.2-S	51.3-SA	51.4-S	1.5-S	51.7-S	51.8-S	BS-BALANCE O	TE-DESTINATI
50.1-S1		[illegible]	[illegible]		135.96									
50.2-S1														
50.3-S1	183461													
50.4-S1														
50.5-S1														
50.6-S1														
50.7-S1														
50.8-S1														
50.9-S1														
50.10-S1														
50.11-S1														
50.12-S1														
50.13-S1														
50.14-S1														
50.15-S1														
50.16-S1														
50.17-S1														
50.18-S1														
50.19-S1														

BA-EN.RC			BAL.SUBSTANC	DESTINATION
51.1-EN			65,163	88,163
51.2-EN			598	597.8
51.3-EN			1,282	1282.3
51.4-EN			649	649.5
51.5-EN			0	0
51.6-EN			142,544	0
51.7-EN			45,598	0
51.8-EN			0	0

50.1-S1														
50.2-S1														