ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA

ESCWA STATISTICAL INFORMATION SYSTEM

TECHNICAL REPORT

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Preface

The Economic and Social Commission for Western Asia (ESCWA), through its Information and Communication Technology Division (ICTD), developed the ESCWA Statistical Information System (ESIS) as an item of technical output within the 2004-2005 programme of work for that Division. The design development and testing of ESIS were undertaken following the recommendations of the ESCWA Consultancy Report of March 2003.

This report provides a brief general description of ESIS, including technical detail of the structure, principal features and utilization modalities, in addition to technical material aimed at facilitating effective use of this System. Within that context, ESIS was developed essentially for use both within ESCWA and by institutions and individuals concerned with economic and social development in the ESCWA region. It is for this latter purpose that a version of ESIS will be posted on the Web.

The ESIS was developed on the basis of in-house resources by the ICTD, with valuable contributions at the design and testing phases from professional and research assistants in ICTD and other ESCWA substantive divisions, principally the Sustainable Development and Productivity Division (SDPD).

ABBREVIATIONS

ESCWA	Economic and Social Commission for Western Asia
ESIS	ESCWA Statistical Information System
ICTD	Information and Communication Technology Division
ITU	Information Technology Unit
PPTCD	Programme Planning and Technical Cooperation Division
SCU	Statistics Coordination Unit
SDD	Social Development Division
SDPD	Sustainable Development and Productivity Division

Introduction

The ESCWA Statistical Information System (ESIS) is intended to provide ESCWA substantive divisions with a single tool through which to store and retrieve indicators, and to monitor data pertaining to a variety of social and economic development sectors in a unified and integrated manner. This centralization of all statistical information increases data integrity by avoiding possible inconsistency in indicator values among divisions, and facilitates backup and recovery to avoid loss of valuable data, thereby enhancing data quality, accessibility and security.

Moreover, through its Web component, ESIS provides similar access to institutions and researchers concerned with socio-economic development across the region and the world, and can facilitate their work. Within the context of the later, the System can assist policymakers in the region in accessing vital statistics in a timely manner. Given that accurate statistics underpin sound policies, the System is expected to have a positive effect on the decision-making process in the ESCWA region, particularly with regard to such policies that promote regional cooperation.

ESIS has benefited from considerable multidivisional interaction throughout its development. This was necessitated by the need to assemble and deploy a set of indicators that encompassed all of ESCWA's activities and that promoted common approaches in terms of clustering and ultimate applications. Throughout this phase of development, considerable emphasis was placed on quality, accessibility and security.

As is the case of other comparable products, the intrinsic worth of ESIS depends ultimately on its usage and the extent to which such usage will contribute towards enhancing the effectiveness and benefit of the System. With that in mind, future work in this domain and in other related areas must take into account some of the more salient lessons learnt during the development of ESIS. A number of such lessons have been distilled into comments that are included in the final section of this report.

Adopted approach

The development approach and technical design of ESIS involved the following stages:

(a) *Needs assessment*: The requirements of each of the substantive divisions of ESCWA were collected. These included the definition of the indicators and specification of indicators to be stored in the System, as well as the reporting and analysis to be supported. This process required the designation of focal points and system administrators for every sector covered by the System;

(b) *System specifications*: Based on the collected requirements, specifications were prepared, including the user interface, databases, performance requirements and server requirements;

(c) *Prototyping*: Based on these requirements, a prototype for the System was developed taking into consideration the following features for the information system:

(i) Central, enterprise-strength database capable of satisfying the requirements;
(ii) Optimization and fine-tuning;
(iii) Migration of indicators data;
(iv) Implementation of security functions;
(v) Development of a user interface, as follows:

a. Administration tasks with the following objectives:

i. To manage regions/countries;
ii. To manage modules, categories and indicators;
iii. To build new derived indicators;
iv. To establish user groups and privileges;

b. Data management tasks, including the following:

i. Updating indicators;
ii. Managing the metadata;
iii. Performing individual/mass data derivations at an indicator level;
iv. Performing individual/mass data aggregation at a region level;
v. Forecasting;

c. Reporting facilities, with the following aims:

i. Country profiles;
ii. Complete set of indicators;
iii. Ranking of countries in a specified region according to a selected indicator;
iv. Customized tables and charts;

(d) *Prototype testing*: An iterative testing model was used to insure product quality and user acceptance. This process began with a small group conducting beta testing of the desktop product and progressively included more users;

(e) *Implementation and deployment*: The full implementation of the System took into consideration the results of testing carried out on the prototype, and incorporated ongoing monitoring and evaluation.

The scope and development timeline of ESIS

Currently, ESIS is set to function as a dedicated software application for desktop personal computers. Consequently, it is expected to facilitate access to indicators and relevant data by staff in all the substantive divisions of ESCWA. Furthermore, through its Web component, decision-makers across the region and the world will be able to access ESIS and benefit from the same indicators and data.

Given that ESIS was chiefly developed to reflect ESCWA priorities, constituent indicators and data have been grouped within functional areas or modules, which reflect such socio-economic and development issues as management of water and energy, globalization and regional integration, social policies and technology. These modules are presented in the following table.

TABLE. ESIS MODULES

	Team/module	Record identifier	Indicators	Data
EAD	National accounts	S097087		
	Finance	S097091		
GRID	Trade	S097086		
	Transport	S097090		
ICTD	Information and communication technology	S101794	✓	✓
SDD	Population and development	S097083	✓	
	Gender	S097085		
	Health and vital statistics	S097089		
	Labour	S097088		
	Social statistics	S097084		
SDPD	Water	S097082	✓	✓
	Energy	S097081	✓	✓
	Environment		✓	✓
	Agriculture		✓	
	Science and technology		✓	✓
	Industry, private sector and production		✓	

Source: Compiled by ESCWA.

Work on the development of ESIS proceeded in several stages (see the following box for a summary of the timeline).

Box. ESIS timeline

- A prototype database system, previously developed within the Information and Communication Technology Division (ICTD), was used as a basis for ESCWA Statistical Information System (ESIS);
- This prototype was redesigned in terms of database structure, desktop and website features, and privileges and data ownership rules;
- An industry-standard platform was adopted in the final version of the System;
- Focal points from all the substantive divisions of ESCWA, who were designated by the respective chiefs of division, met with the ICTD development team to review the design of the System. The resulting feedback was incorporated and subjected to another round of consultations, which subsequently paved the way for the current design. Coordination with the focal points on system development was maintained throughout the ESIS development cycle;
- All the substantive divisions of ESCWA were invited to attend a pre-delivery status review meeting for the express purpose of soliciting final feedback and change requests. Feedback was only received from SDPD, and was incorporated into the system design;
- ICTD consulted with the Information Technology Unit (ITU) on several occasions to discuss product hand-over and strategy for continued support. Furthermore, a detailed deployment plan for the desktop and Web interfaces of ESIS were devised in consultation with ITU. Issues regarding synchronization with the ESCWA Internet Service Provider were addressed. Conformity with United Nations standards for automated software deployment was equally raised;
- ICTD executed a robust testing plan that included testing by peers and focal points, ultimately incorporating feedback as appropriate;
- User documentation was completed, and help files were integrated into the System to provide end-user support.

Source: Compiled by ESCWA.

Basic ESIS specifications

ESIS addresses two main concerns of statistical information systems, namely:

(a) Data integration, which concerns interlacing data from different subject domains. For example, combining science and technology statistics with social statistics can result in collated datasets aimed at enabling consistent interpretation and subsequent analysis;

(b) Data harmonization, which pertains to interlacing data from the same subject domain through different sources. For example, integrating population statistics from different countries as provided by different substantive divisions ensures coherence.

ESIS comprises a modular repository of customized and comparable data for all substantive divisions of ESCWA. In essence, the System allows both desktop and secure online access, with a common interface leading to a consistent look and feel. In addition to common tools for data entry, reporting and analysis, custom-tailored tools can be added through the desktop interface. Furthermore, ESIS is in Arabic and in English and has three levels of access with different privileges to facilitate administration, data management and reporting, with customized and standard reports.

Indicators and available data

The table above presents a list of the modules available within ESIS as of August 2005. Currently, ESIS holds indicators for eight modules, four of which are not included in the original 12 modules.[1] Moreover, of these eight modules now available in ESIS, five have been supplied with data.

[1] The original modules included energy resources and use; water resources and use; population; and information and communication technology (ICT). The new modules, which were added by SDPD, include environment; agriculture and rural development; industry, private sector and production; and science and technology.

Testing process

An iterative testing model has been used to ensure product quality and user acceptance. This process began with a small group conducting beta testing of the desktop product, and progressively included more users until the final Web-based product was adequately screened.

Ongoing data maintenance

Data will be maintained by focal points from the various teams assigned by their respective divisions. The Statistical Coordination Unit (SCU) has asserted within the framework of its programme management plan for 2005 that it is taking up the responsibility for maintaining all ESIS modules.

Suggestions for future action

Participants in the Workshop on Information Society Measurements: Core Indicators, Statistics and Data Collection (Beirut, 7-10 June 2005) indicated that ESIS could serve as part of an overall regional capacity-building strategy aimed at assisting member countries in collecting, manipulating and disseminating statistical indicators and corresponding information. Within that context, representatives of national statistical offices in the ESCWA member countries expressed interest in using ESIS.

A formal ESCWA strategy needs to be formulated in order to facilitate the continued maintenance and future development of ESIS. With that in mind and given that activities by the Information and Communication Technology Division (ICTD) do not include items that relate to developing and upgrading ESIS, ICTD is prepared to opt for an “open-source” development policy for all interested parties. The most appropriate modality for future ESIS development and upgrading is expected to involve close coordination and liaising between SCU and the Programme Planning and Technical Cooperation Division (PPTCD), thereby ensuring that relevant procedures are followed, lessons are learnt and successes are adequately disseminated.

Within the framework of the programme plans of ICTD, SCU as well as other concerned divisions in ESCWA, future data updating and system functional maintenance will need to be undertaken by SCU in coordination with team leaders and functional points of contact in the substantive divisions of ESCWA.

During the coordination meetings between the departmental focal points and ITU, interest has been expressed in the devotion of resources for continuing maintenance and updating the product. In order to meet this and associated needs, there is a proposal to establish a small, dedicated software development and support unit or team within ITU.

Concluding remarks

ESIS provides a centralized repository for the statistical indicators of ESCWA. Through the desktop interface, users can create new indicators, update values and undertake other necessary functions. The integrated bilingual support and online interface makes it possible for the System to increase significantly services to member countries by making indicators and relevant data more readily available to policymakers and interested parties across the region and the world.

The product has been rigorously tested and deployed following a multidisciplinary approach involving various departments and sub-programmes in order to achieve the highest quality output possible.

Annex I

OVERVIEW OF THE SYSTEM

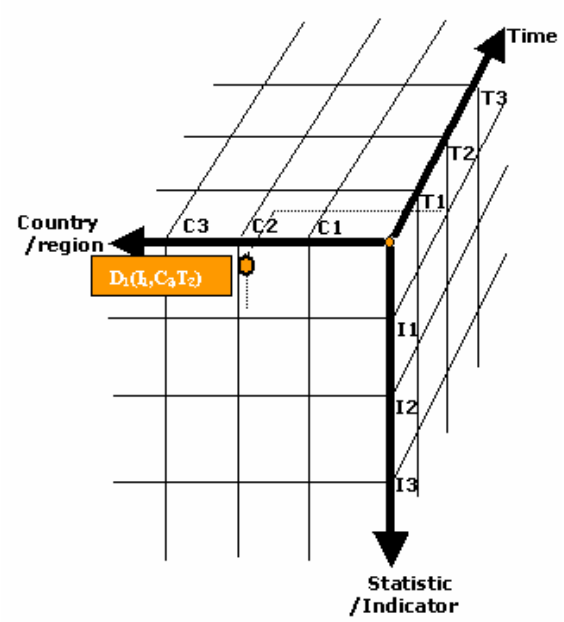
ESIS is a system for storing, managing and retrieving statistical indicators for a specified group of countries or regions and a specified time series. It incorporates a core database, which is designed such that it allows both desktop and secure online access.

Moreover, ESIS has been developed using the Microsoft SQL server, which is the enterprise data management platform that provides rich data analysis and data mining capabilities. In order to facilitate the access to the database and to provide both a common interface and a consistent feel for all ESCWA users, the desktop component of ESIS was developed using the Visual Basic 6.0 programming tool. This desktop component, which allows ESCWA staff to manage and update the statistical data, is complemented by the online component of ESIS, which has been developed using the ASP.NET Web development tool. This online component makes ESIS accessible to ESCWA member countries, as well as to researchers and decision makers from across the region and the world.

A. MAIN DIMENSIONS OF THE SYSTEM

The main dimensions of ESIS comprise a three-dimensional space whereby the three axes represent, respectively, time, country or regional group of countries, and statistics/indicators (see annex figure 1). A data point in this space represents the intersection of the values on the three axes. The System is flexible and allows the expansion of these three dimensions.

Annex figure 1. The three dimensions of ESIS



Each administrator from the various divisions has the right to update the sets of statistics/indicators that relate to the modules belonging to the respective division. Data managers have the choice to update the database by direct manual data entry, by automatic computation or by data transfer from such spreadsheet programs as Excel.

Owing to the gaps in the national data of member countries, users have been compelled to seek such statistics from other regional and international sources, which in turn created a need to maintain intricate records of sources of the data and other necessary notes. Consequently, ESIS was developed to establish a

dedicated procedure for managing the metadata, thereby facilitating reference for a given value of one indicator for a particular country or year.

Given the high capabilities of Excel in terms of data analysis and computation, this application is used as the principal repository of ESIS reports. Through various selection screens, the user can select the desired dimensions and preview the data before producing relevant tables and charts in Arabic, English or in both languages.

B. USERS OF ESIS

The database has a single database owner, with provisions for several administrators, data managers and guests from all the divisions of ESCWA and through its online component. The functions of each group of users are summarized as follows:

(a) The database owner has full authority on the database, including the right to add new users to the database and to assign roles and passwords to them;

(b) A user belonging to the administrators group can perform administrative tasks, including adding or updating modules, indicators, countries and years, in addition to building new indicators. More than one administrator from the various divisions can access the application simultaneously;

(c) A user belonging to the data management group is entitled to manage the data and the metadata. Many data managers from different divisions can access the database concurrently;

(d) The System can support many guests visiting the database at the same time and sharing the same information and tables simultaneously, in addition to issuing selected reports and charts. The online component of ESIS enables external users to query the database and produce reports. All external users belong to the guest group.

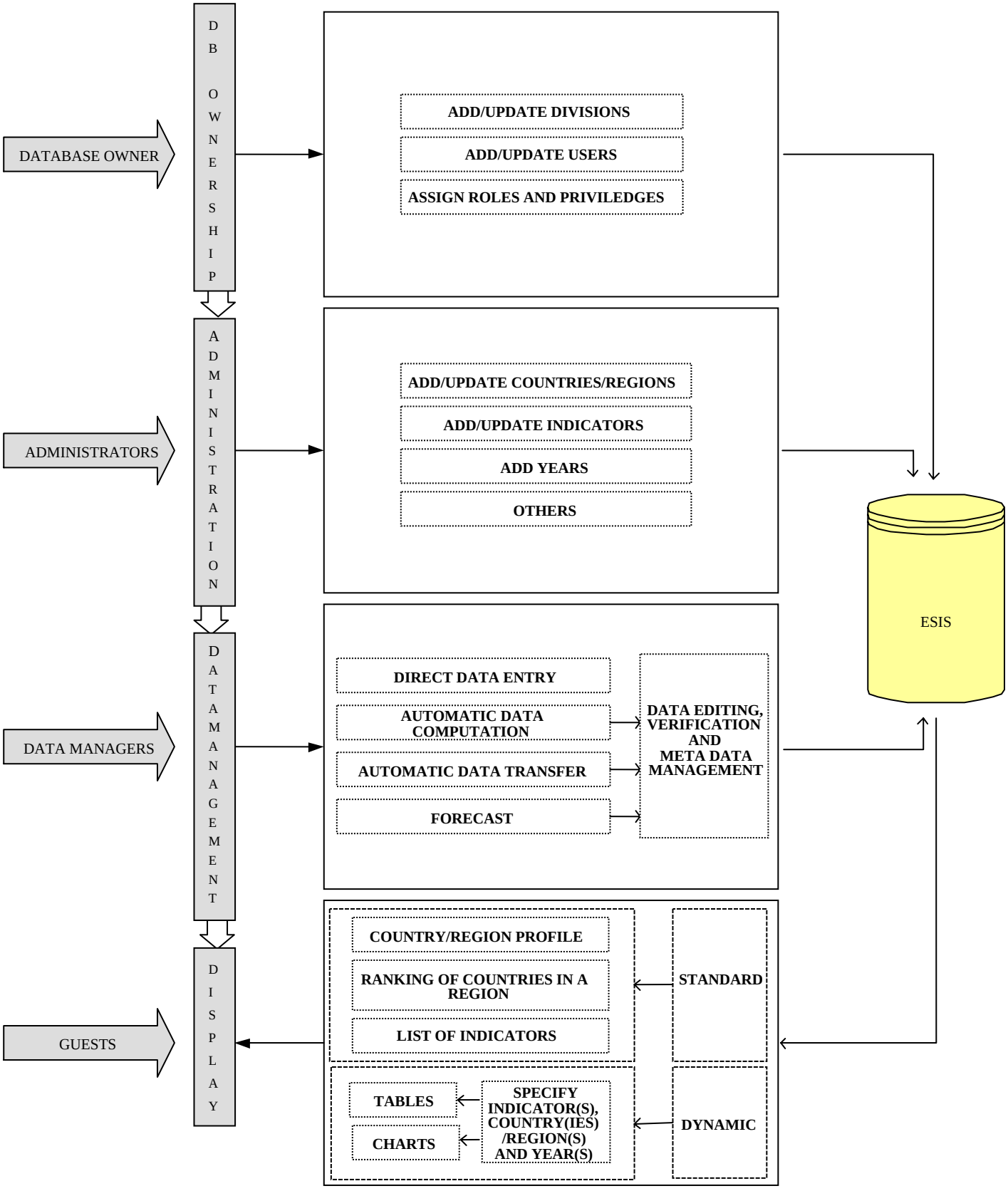
Annex figure 2 summarizes the role of users belonging to the different groups and their respective functions.

C. INPUT MODULES

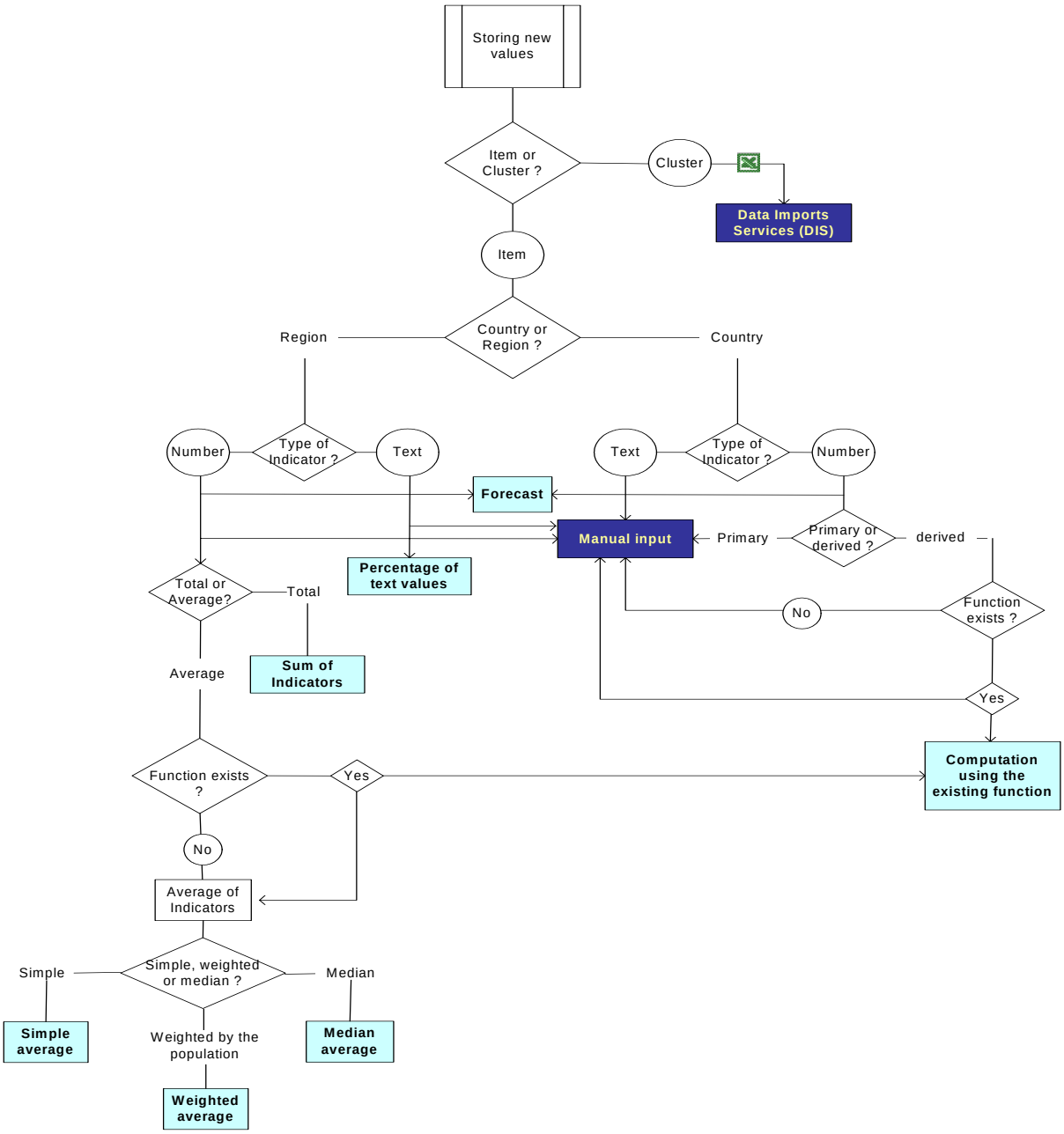
Annex figure 3 illustrates the existent procedures that permit data managers to store new values, as well as the processes available to generate new values out of the existing data. Specifically, data can be stored in two ways, namely: (a) import of a cluster of data from an Excel spreadsheet; and (b) manual data entry of individual data items.

Additionally, the five functions available to process the existing data are as follows: (a) forecasts based on historical data; (b) computation using existing functiosns; (c) percentage of text values; (d) sum of indicators; and (e) average of indicators, including simple, median, and weighted by the population.

Annex figure 2. The role of users within ESIS



Annex figure 3. Input procedures for ESIS



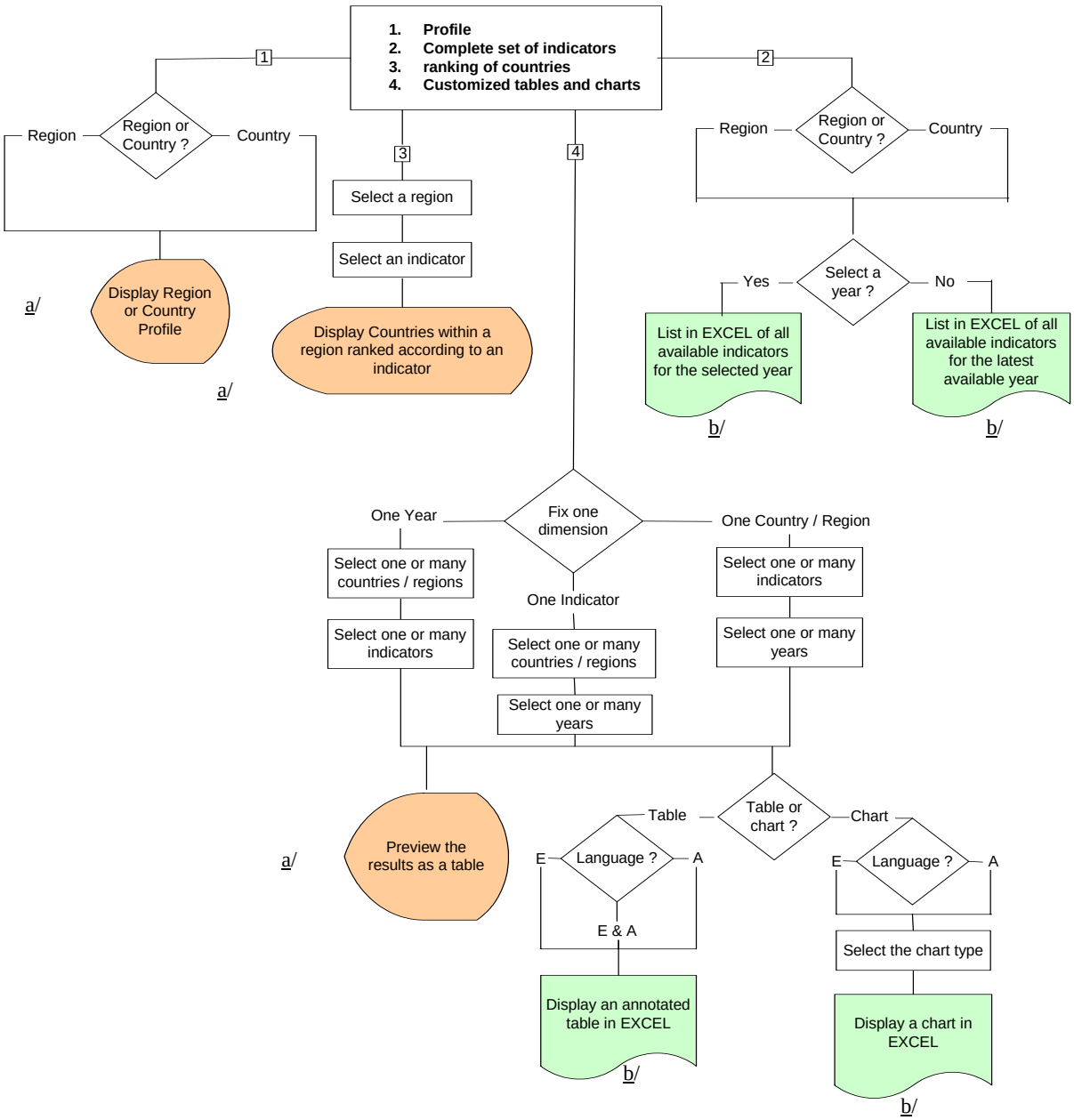
Source: Compiled by ESCWA.

D. OUTPUT MODULES

The reporting function of the desktop component enables users to display standard or dynamic reports. Standard reports are predefined and preformatted for quick view or display of the information. These enable users to retrieve quickly a profile or a complete set of indicators for a specified country or region. Additionally, they provide users with the option of making a ranking of countries within a region for a

specified indicator. By contrast, dynamic reports give the users the ability to identify their own selection of countries or regions, indicators and years. Subsequent to such a tailored selection, they can proceed to produce a table or a chart in Excel. The indicators available for selection in the dynamic reporting option depend on the chosen modules in the log in process. Annex figure 4 represents the various reports that can be generated from ESIS.

Annex figure 4. ESIS outputs



Source: Compiled by ESCWA.

Notes: a/ These result in standard reports.
b/ These result in dynamic reports.

E. DATABASE OBJECTS

Annex box 1 summarizes all the entities and contents of ESIS.

Annex box 1. ESIS entities and contents

Divisions: All substantive divisions of ESCWA;

Modules: All statistical modules;

Categories: All categories in English and Arabic;

Sub-categories: All sub-categories in English and Arabic;

Indicators: All indicators in English and Arabic and their properties;

Conference: Any conference or event that initiated the generation of a collection of indicators;

Collection: All collections of indicators in English and Arabic;

Data: Numeric and text values representing the values of indicators;

Derived: Record of the calculated indicators;

Countries: All countries and groups of countries in English and Arabic, including various national properties;

Count_CGrps: Assures the group to country (parent-child) relationship;

Series: A combination of a given category, country or group with a particular year;

Notes: All Notes in English and Arabic;

Sources: All Sources in English and Arabic;

Text Values: All text values in English and Arabic;

Ranges: Assures the indicator to text value (parent-child) relationship;

Times: Stores time periods that could be one year or half a year;

Scale: Stores the scale factor values;

Users: All the names and passwords of the users;

User_Mod: Assures the users to modules (parent-child) relationship.

Source: Compiled by ESCWA.

ANNEX TABLE 1. ESIS CODES FOR THE SUBSTANTIVE DIVISIONS OF ESCWA

Division	Acronym	Code
Economic Analysis Division	EAD	6992
ESCWA Common[a/]	EC	9999
Globalization and Regional Integration Division	GRID	7000
Information and Communication Technology Division	ICTD	6998
Social Development Division	SDD	6994
Sustainable Development and Productivity Division	SDPD	6996

Source: Compiled by ESCWA.

a/ ESCWA Common is a virtual division representing the repository of the indicators needed by all other divisions.

ANNEX TABLE 2. ESIS MODULES

Module
Energy resources and use
Industry, private sector and productivity
Information and communication technology
Population and development
Science and technology
Sustainable agriculture and rural development
Sustainable management of the environment
Water resources and use

Source: Compiled by ESCWA.

F. ORGANIZING THE STATISTICS/INDICATORS

Indicators are statistical entities conceived to assess the development of an economic or a social sector through time and space. In ESIS, the "indicators" entity sometimes refers to primary or raw statistics, while at other times it refers to indicators or statistics derived from others. For this reason, the set of indicators is divided into the following two sub-sets:

(a) Primary indicators, which are raw statistics or statistics that are not associated to a formula;

(b) Derived indicators, which are those statistics that are the result of a computation of other statistics.

However, within the framework of ESIS, some derived statistics are treated as primary owing to the lack of the statistics needed to construct their formula. For example, despite the fact that most of the indices are the result of a complex calculation of statistics/indicators, they are treated as "primary indicators" in the System either because the formula is unknown or the data needed to compute the indices does not exist.

1. *Grouping indicators into modules*

Annex box 2 summarizes the keywords used to group and organize the indicators into modules.

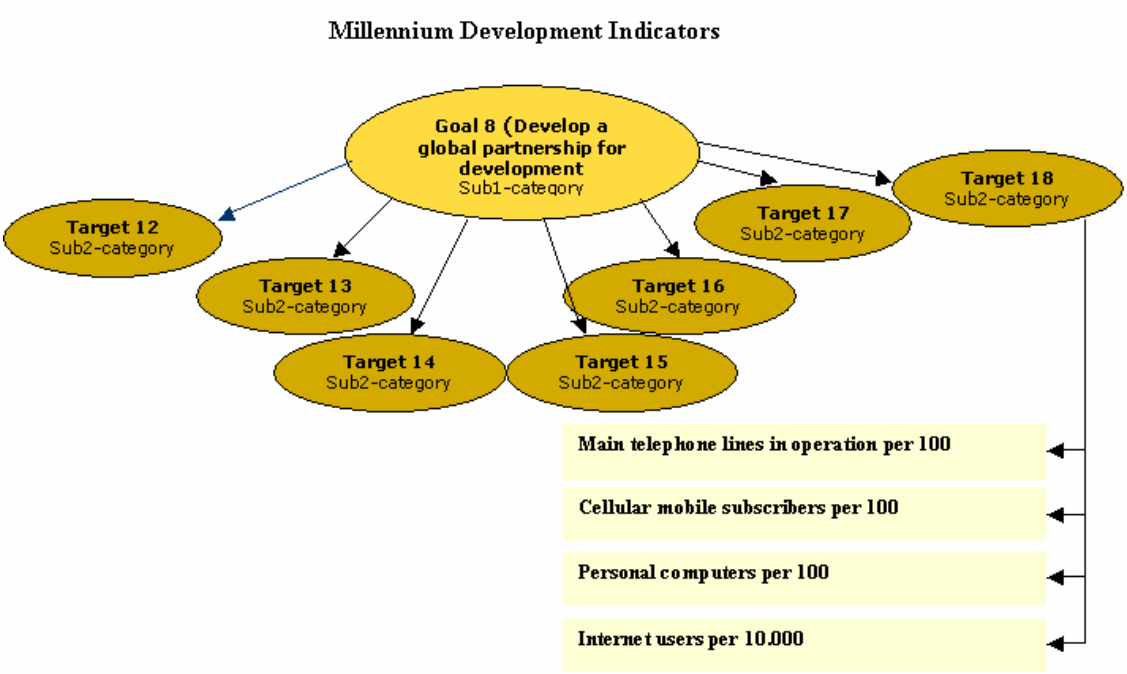
Annex box 2. ESIS keywords used to group indicators into modules

- *Module*: An organized set of indicators/statistics related to a specific sector and targeting the same theme (for example "Energy resources and use");
- *Category*: A sub-grouping of a module (for example "Electricity" within "Energy resources and use");
- *Sub-category*: A sub-grouping of a category (for example "Production" within "Electricity");
- *Indicator*: A statistical entity that can be primary or derived. Derived indicators can include in their formula indicators from different categories and modules, as well as other derived indicators. However, they may not include the derived indicators themselves.

Source: Compiled by ESCWA.

Given that each indicator is unique in the ESIS database, an indicator cannot be included in more than one module, category or sub-category.

Annex figure 5. Allocation of ICT indicators in ESIS within the MDG collection



Source: Compiled by ESCWA.

2. *Allocating indicators into collections*

By contrast to the modules grouping, the indicators in a collection are not related to a specific sector or theme. The indicators in the set of collections are not unique. In other words, an indicator can belong to more than one collection. If an indicator does not exist in the database, it cannot be added to a collection.

Annex 3 box summarizes the keywords used to allocate indicators into collections.

Annex box 3. ESIS keywords used to allocate indicators into collections

Collection: an organized set of indicators/statistics not necessarily related to a specific economic or social sector. The indicators are not unique in the set of collections (for example the "Millennium Development Indicators");

Sub1-collection: A sub-grouping of a collection (for example "Goal 8" within the "Millennium Development Indicators");

Sub2-collection: A sub-grouping of a sub1-collection (for example "Target 12" within "Goal 8");

Indicator: A collection can be related to different modules or sectors, and is not unique in the set of collections.

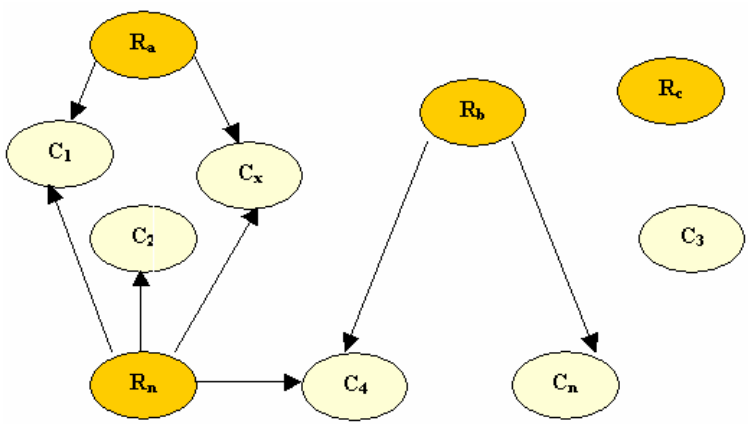
Source: Compiled by ESCWA.

G. ORGANIZING REGIONS AND COUNTRIES

Countries and regions in ESIS constitute one mixed entity. For this reason, regions are treated like stand-alone countries. In some cases, and where the countries belonging to a region exist in the database, a grouping of countries can be undertaken.

As indicated in annex figure 6, a region can exist as an independent item (R_c), or as a group of countries (R_a). A country can be included in one or more regions (C_4), or can exist as an independent item (C_3).

Annex figure 6. Organizing regions and countries in ESIS



Source: Compiled by ESCWA.