

Innovation System Indicators: Directory of Indicators

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Part One: Future Research and Development (R&D) Capacity

HEIs' Foreign Student Population

IDC_1012

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An indicator of international flows of skilled human resources, the attractiveness of an innovation system and knowledge networks. Note coverage of public institutions.

Indicator Methodology: Usually expressed as a percentage of total enrolments

Age distribution of the population

IDC_1014

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): Mid-Year Population Estimates_DDC_10003

Comments on indicator: An indicator of inflows and outflows in to the work-force. Also indicates demand for innovations and willingness to learn new technology.

Indicator Methodology: Usually expressed in ten-yearly increments as a percentage of total population.

Total Population

IDC_1015

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): Mid-Year Population Estimates_DDC_10003

Comments on indicator: An indicator of human resources in broad sense. Also indicates demand for innovations.

Indicator Methodology: Usually expressed as count data.

Employment participation

IDC_1016

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: An indicator of the proportion of an economy's human resources that are mobilized. It thereby suggests a potential or limit to further growth in knowledge demand.

Indicator Methodology: Derived by taking the sum of employed and unemployed population, the economically active, and dividing that sum by the total working age population, defined as individuals between age 15 and 65.

Non-economically active working age population

IDC_1017

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: An indicator of the proportion of an economy's human resources that are not mobilized. It thereby suggests potential for further growth in knowledge demand.

Indicator Methodology: Usually expressed as count data.

Unemployment rate(s)

IDC_1018

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: An indicator of an economy's ability to supply jobs to those seeking to work. Therefore, it can indicate divergence between available skills and the demand for those skills in the economy.

Indicator Methodology: Derived by taking the number of people who are willing and able to work but have no jobs, the unemployed, divided by the total number of people who are willing and able to work, the economically active population. Gender and racial sub-populations also derived similarly. The "broad-unemployment" rate is another related indicator which adds discouraged work-seekers to both the unemployed and economically active populations.

Highest Education Level of Working Age Population

IDC_2001

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: An indicator of the proportion of an economy's human resources that are mobilized to engage in knowledge intensive employment. It thereby suggests a potential or limit to further growth in knowledge demand.

Indicator Methodology: Derived by taking the ratio of the population in each of four educational level cohorts by the total working age population, defined as individuals between age 15 and 65.

Percentage of population with tertiary education

IDC_2002

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: An indicator of the proportion of an economy's human resources that are mobilized. It thereby suggests a potential or limit to further growth in knowledge demand.

Indicator Methodology: Derived by taking the ratio of the population over age 20 reporting tertiary education by the total population over age 20.

Literacy rate of population

IDC_2003

Date of this info: 16/02/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: An indicator of the proportion of an economy's human resources that are mobilized. It thereby suggests a potential or limit to further growth in knowledge demand.

Indicator Methodology: Derived by taking the ratio of those literate over age 15 by the total population over age 15.

Participation in lifelong learning

IDC_2004

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006; Mid-Year Population Estimates_DDC_10003

Comments on indicator: Lifelong learning is an important component of a knowledge intensive society, indicating a society's mobilization of knowledge resources towards iterative learning.

Indicator Methodology: Derived by taking the number of individuals over age 24 who report themselves undertaking some formal education or training programme (DDC_10006). Provincial figures data constraints require reporting the population over age 14 who reported attending an educational institution beyond the Grade 12 level (DDC_10006). Rates of participation are derived by dividing by their respective total population (DDC_10003).

Nature of lifelong learning institutions

IDC_2005

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: Indicates institutional preferences of learners for their supply of lifelong learning.

Indicator Methodology: Derived by taking the number of individuals over age 24 who report themselves undertaking some formal education or training programme and then deriving shares amongst the four categories of institutions reported in DDC_10006.

School Learner Enrolments

IDC_2006

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: A primary basic education system indicator of an economy's mobilization of human capital resources. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Adult Basic Education and Training Institutions Enrolments

IDC_2007

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: Another basic education system indicator of an economy's mobilization of human capital resources. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Further Education and Training Institutions Enrolments

IDC_2008

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: Another basic education system indicator of an economy's mobilization of human capital resources. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Total Higher Education Institutions Enrolments

IDC_2010

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of the intensity of knowledge mobilization in an economy. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Total Contact Higher Education Institutions Enrolments

IDC_2011

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of the intensity of knowledge mobilization in an economy. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Total Distance Higher Education Institutions Enrolments

IDC_2012

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of the intensity of knowledge mobilization in an economy. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Learners writing Senior Certificate Examination (SCE) and SCE pass rates

IDC_2013

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of general secondary education outputs as an indicator of knowledge mobilization in an economy. Note coverage of public and private institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Learners receiving SCE with distinction & select higher grades subject pass rates

IDC_2014

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of secondary education outputs with a higher probability of entering the science and technology system as an indicator of knowledge mobilization in an economy. Note coverage of public and private institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Undergraduate degrees/diplomas granted

IDC_2015

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of general public higher education institutions (HEI) outputs. HEI outputs represent capacity of an economy to absorb, transform and diffuse knowledge and thereby also indicate resources for highly skilled employment. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

Postgraduate degrees granted

IDC_2016

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of public higher education institutions (HEI) most skilled outputs. HEI postgraduate outputs represent capacity closely additions to the science and technology system in an economy. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

School Learners to Educators Ratio

IDC_2017

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An indicator of the relative quality of education received by school learners. Trends in the ratio can also indicate mobilization or underdevelopment of a knowledge intensive economy. Note coverage of public and private institutions.

Indicator Methodology: Expressed as total headcount of learners divided by headcount of educators.

Adult Basic Education and Training (ABET) Learners to Educators Ratio

IDC_2018

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An indicator of the relative quality of education received by ABET learners. Trends in the ratio can also indicate mobilization or underdevelopment of a knowledge intensive economy. Note coverage of public institutions.

Indicator Methodology: Expressed as total headcount of learners divided by headcount of educators.

Further Education and Training (FET) Learners to Educators Ratio

IDC_2019

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An indicator of the relative quality of education received by FET learners. Trends in the ratio can also indicate mobilization or underdevelopment of a knowledge intensive economy. Note coverage of public institutions.

Indicator Methodology: Expressed as total headcount of learners divided by headcount of educators.

Higher Education Institution (HEI) Learners to Educators Ratio

IDC_2020

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An indicator of the relative quality of education received by HEI learners. Trends in the ratio can also indicate mobilization or underdevelopment of a knowledge intensive economy. Note coverage of public institutions.

Indicator Methodology: Expressed as total headcount of learners divided by headcount of educators.

Science, Engineering and Technology Enrolments

IDC_2022

Date of this info: 17/02/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of the intensity of knowledge mobilization in an economy. The indicator requires defining a sub-set of science, engineering and technology (SET) enrolments from registered degree data. Note coverage of public institutions.

Indicator Methodology: Following UNESCO and OECD methodologies SET enrolments may be defined with the International Standard Classification of Education (ISCED) classification system (UNESCO, 1997). Accordingly SET enrolments include the following fields: Life sciences (ISCED 42), Physical sciences (ISCED 44), Mathematics and statistics (ISCED 46) and Computing (ISCED 48), Engineering and engineering trades (ISCED 52), Manufacturing and processing (ISCED 54), Architecture and building (ISCED 58), Agriculture, forestry and fishery (ISCED 62), Veterinary (ISCED 64), and Health (ISCED 72).

EMIS data is reported according to Classification of Educational Study Matter (CESM) codes (Department of Education, 2004). Following the ISCED defined fields the CESM correspondence includes: The sum of fields under Agriculture and Renewable Natural Resources (CESM 01), the sum of fields under Architecture and Environmental Design (CESM 02), the sum of fields under Computer Science and Data Processing (CESM 06), the sum of fields under Engineering and Engineering Technology (CESM 08), the sum of fields under Health Care and Health Sciences (CESM 09), and the subfields of Construction (CESM 1101), Manufacturing (CESM 1102), and Power Systems (CESM 1103) with the field of Industrial Arts, Trades and Technology (CESM 11), as well as the sum of fields under Life Sciences and Physical Sciences (CESM 15), and the sum of fields under Mathematical Sciences (CESM 16). Indicator usually expressed as count data.

Science, Engineering and Technology Graduates

IDC_2023

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of public higher education institutions (HEI) outputs with high probabilities of further participation in the science and technology system. The indicator requires defining a sub-set of science, engineering and technology (SET) graduates. Note coverage of public institutions.

Indicator Methodology: Following UNESCO and OECD methodologies SET enrolments may be defined with the International Standard Classification of Education (ISCED) classification system (UNESCO, 1997). Accordingly SET graduates include the following fields: Life sciences (ISCED 42), Physical sciences (ISCED 44), Mathematics and statistics (ISCED 46) and Computing (ISCED 48), Engineering and engineering trades (ISCED 52), Manufacturing and processing (ISCED 54), Architecture and building (ISCED 58), Agriculture, forestry and fishery (ISCED 62), Veterinary (ISCED 64), and Health (ISCED 72).

EMIS data is reported according to Classification of Educational Study Matter (CESM) codes (Department of Education, 2004). Following the ISCED defined fields the CESM correspondence includes: The sum of fields under Agriculture and Renewable Natural Resources (CESM 01), the sum of fields under Architecture and Environmental Design (CESM 02), the sum of fields under Computer Science and Data Processing (CESM 06), the sum of fields under Engineering and Engineering Technology (CESM 08), the sum of fields under Health Care and Health Sciences (CESM 09), and the subfields of Construction (CESM 1101), Manufacturing (CESM 1102), and Power Systems (CESM 1103) with the field of Industrial Arts, Trades and Technology (CESM 11), as well as the sum of fields under Life Sciences and Physical Sciences (CESM 15), and the sum of fields under Mathematical Sciences (CESM 16).

Indicator usually expressed as count data.

Ph.D. Graduates

IDC_2024

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of very highly skilled public higher education institutions (HEI) outputs. Indicator is thereby a proxy for the generation of highest levels of skills.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.

National Qualification Framework Level 6 to 8 Graduates

IDC_2026

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of public higher education institutions (HEI) outputs at all levels. NQF level 6 to 8 graduates include all HEI qualifications except National diplomas and National certificates (NQF Level 5). As such it is a traditional indicator of all tertiary level graduates. Note coverage of public institutions.

Indicator Methodology: Usually expressed as count data. They can be disaggregated by race, nationality and gender.:

Engineering Graduates

IDC_2027

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_12001

Comments on indicator: An important indicator of high level technical skills produced by public higher education institutions (HEI). The indicator requires defining a sub-set of science, engineering and technology (SET) enrolments from registered degree data. Note coverage of public institutions.

Indicator Methodology: Following UNESCO and OECD methodologies SET enrolments may be defined with the International Standard Classification of Education (ISCED) classification system (UNESCO, 1997). Accordingly engineering graduates consists of Engineering and engineering trades (ISCED 52). EMIS data is reported according to Classification of Educational Study Matter (CESM) codes (Department of Education, 2004). Following the ISCED defined fields the CESM correspondence consists of the sum of fields under Engineering and Engineering Technology (CESM 08). Indicator usually expressed as count data, it can be disaggregated by race, nationality and gender.

Gross enrolment ratios in higher education

IDC_5008

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): EMIS_DDC_1200; Mid-Year Population Estimates_DDC_10003

Comments on indicator: Indicates the general level of participation in higher education. It is thereby a proxy for the capacity of the higher education system to enrol students of the associated age group. It can also be a complementary indicator to net enrolment rate (NER) by indicating the extent of over-aged and under-aged enrolment. Note coverage of public higher education institutions.

Indicator Methodology: Following UNESCO methodologies the gross enrolment ratio in higher education is calculated by dividing the number of learners enrolled in HEI, regardless of age, by the total population between the school leaving age and five years after that age (15- 20). By convention the ratio is multiplied by 100. In South Africa the school leaving age, the minimum age which a person is legally allowed to leave compulsory education, is 15. Total headcount of HEI enrolments are available in DDC_1200 and the population data from DDC_1003.

Part Two: Current R&D Capacity

R&D Intensity

IDC_3001

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator: R&D intensity expresses the effort on formal research and development expenditures relative to gross domestic product.

Indicator Methodology: Calculated by expressing GERD as a percentage of GDP. GDP data is reported in DDC_10001 and GERD is reported in DDC_11001.

Provincial shares of R&D expenditures

IDC_3002

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator: Provincial R&D intensity expresses the effort on formal research and development expenditures relative to provincial gross domestic product (GDPR).

Indicator Methodology: Calculated by expressing Provincial GERD as a percentage of GDPR. GDPR data is reported in DDC_10001 and Provincial GERD is reported in DDC_11001.

Evolution of gross domestic expenditures on R&D

IDC_3003

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator: Real R&D expenditures over time indicate trends on formal research and development expenditures.

Indicator Methodology: Calculated by expressing GERD in constant 2000 Rand values. Nominal R&D expenditure data is reported in DDC_11001 constant 2000 Rand values calculated through the Consumer Price Index (CPI) DDC_10002.

R&D expenditure by source of financing

IDC_3004

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: Reports across four-sectors the source of R&D financing.

Indicator Methodology: Reported in line with the OECD *Frascati Manual* methodology in DDC_11001.

R&D expenditure by performing sector

IDC_3005

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: Reports who undertakes R&D activities across five-sectors.

Indicator Methodology: Reported in line with the OECD *Frascati Manual* methodology in DDC_11001.

R&D expenditure by research field

IDC_3006

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: Nature of R&D expenditures according to self-identified research fields.

Indicator Methodology: Reported in line with the OECD *Frascati Manual* methodology in DDC_11001.

R&D expenditure by social economic objective

IDC_3007

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: Nature of R&D expenditures according to self-identified social economic objectives.

Indicator Methodology: Reported in line with the OECD *Frascati Manual* methodology in DDC_11001.

R&D expenditure by type of research

IDC_3008

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: Nature of R&D expenditures according to self-identified type of research.

Indicator Methodology: Reported in line with the OECD *Frascati Manual* methodology in DDC_11001.

Public R&D expenditure intensity

IDC_3009

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator: An indicator of the relative contribution to R&D expenses by the public sector.

Indicator Methodology: Public R&D expenditures are calculated in a broad-sense as the difference between total R&D expenditures (GERD) and business enterprise expenditures on R&D (BERD) as a percentage of GDP. GDP data is reported in DDC_10001 and GERD as well as BERD are reported in DDC_11001.

Business expenditures on R&D (BERD) intensity

IDC_3010

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator: An indicator of the relative contribution of business enterprise expenditures on R&D (BERD).

Indicator Methodology: Calculated as (BERD) as a percentage of GDP. GDP data is reported in DDC_10001 and BERD is reported in DDC_11001.

BERD as a percent of Total Value-Added

IDC_3011

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator: An indicator of the relative contribution of business enterprise expenditures on R&D (BERD) to total value addition.

Indicator Methodology: Calculated as (BERD) as a percentage of industry value added. Industry value added data is reported in DDC_10001 and BERD is reported in DDC_11001.

BERD by sector

IDC_3012

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: Nature of BERD by economic sector of the business performing the R&D.

Indicator Methodology: Reported in line with the OECD *Frascati Manual* methodology in DDC_11001.

Bibliometric Outputs and Rankings

IDC_4012

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): InCites_DDC_51001

Comments on indicator: Total numbers and relative shares of publications by discipline are important indicators of knowledge outputs in an innovation system.

Indicator Methodology: Number of Scientific publications with at least one South African author in ISI Journals is reported as count data. The South African share is calculated as the ratio of those publications divided by the total number of publications in worldwide. Data for these bibliometric outputs and rankings is reportedly contained in the ISI database InCites_DDC_51001, but verification from ISI is still outstanding at the time of this entry.

Bibliometric Activity Indices and Relative Impact Ratios

IDC_4013

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): InCites_DDC_51001

Comments on indicator: The activity index and the relative impact ratio are important bibliometric indicators of knowledge outputs in an innovation system. If South Africa publishes in a field at a rate greater than the world average rate for that field it will record an activity index greater than unity. If South Africa publishes in a field at a rate less than the world average rate for that field it will record an activity index less than unity. A relative impact ratio greater than unity indicates South African publications citations in a particular scientific field are higher than citation in the field as a whole worldwide. Conversely, a relative impact ratio less than unity indicates South African publications citations in a particular scientific field are lower than the citations rate in the field as a whole worldwide.

Indicator Methodology: The activity index can be calculated as:

$$\frac{(\text{South African Publications in field } x_i \text{ in Period } T | \text{ South African Publications in all fields } \sum x_i \text{ in Period } T)}{(\text{Worldwide Publications in field } x_i \text{ in Period } T | \text{ Worldwide Publications in all fields } \sum x_i \text{ in Period } T)}$$

Similarly the relative impact ratio can be calculated as:

$$\frac{(\text{South African Citations in field } x_i \text{ in Period } T | \text{ South African Citations in all fields } \sum x_i \text{ in Period } T)}{(\text{Worldwide Citations in field } x_i \text{ in Period } T | \text{ Worldwide Citations in all fields } \sum x_i \text{ in Period } T)}$$

Data for these indicators is reportedly contained in the ISI database InCites_DDC_51001, but verification from ISI is still outstanding at the time of this entry.

Part Three: Imported Know-how

Technology Balance of Payments

IDC_5009

Date of this info: 23/03/09

Alternative indicator descriptor: None

Associated Database(s): OECD Technology Balance of Payments Database_DDC_55001; Foreign exchange rate: SA cent per USA dollar Middle rates_DDC_13004; Gross Domestic Product (GDP) _DDC_10001; R&D Survey_DDC_11001

Comments on indicator: The technology balance of payments measures international transfers of technology: licences, patents, know-how and research, technical assistance. Unlike R&D expenditure, these are payments for production-ready technologies. The vast majority of these transactions correspond to operations between parent companies and affiliates. Although the technology balance of payments reflects a country's ability to sell its technology abroad and its use of foreign technologies, a deficit position does not necessarily indicate low competitiveness. Payments as a percentage of GERD give an indication of the share of imported technology to domestic R&D effort.

Indicator Methodology: Technology receipts and payments constitute the main form of disembodied technology diffusion. Trade in technology comprises four main categories:

- Transfer of techniques (through patents and licences, disclosure of know-how).
- Transfer (sale, licensing, franchising) of designs, trademarks and patterns.
- Services with a technical content, including technical and engineering studies, as well as technical assistance.
- Industrial R&D.

The main limitations of these data are the heterogeneity of their content at country level and the difficulty of dissociating the technological from the non-technological aspect of trade in services, which falls under the heading of pure industrial property. Trade in services may be underestimated when a significant proportion does not give rise to any financial payments or when payments are not made in the form of technology payments. Currently, the OECD Technology Balance of Payments Database_DDC_55001 is the primary source of data on technology receipts and payments.

Receipts as a percentage of GDP, Payments as a percentage of GDP, the Balance as a percentage of GDP are all important indicators derived from the technology balance data. These can all be calculated by converting the dollar figures reported in the OECD database to Rand values with DDC_13004 and then dividing by corresponding GDP data from DDC_10001. Similarly, payments as a percentage of GERD can be calculated by converting the dollar figures reported in the OECD database to Rand values with DDC_13004 and then dividing by corresponding GERD data from DDC_11001.

Foreign Liabilities of South Africa from Direct Investment

IDC_5001

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Capital movements of liabilities: Total direct investment_DDC_13010; Foreign liabilities: Direct investment by source_DDC_13006; Gross Domestic Product (GDP) _DDC_10001;

Comments on indicator: Foreign direct investment (FDI) is an investment involving a long-term relationship and reflecting a lasting interest and control by an entity in one economy (foreign direct investor or parent company) in an enterprise resident in another economy. Inflows of FDI as a percent of GDP measure the relative importance of associated knowledge inputs to an economy. FDI stock data as a percentage of GDP is used as an indicator of the rate of FDI saturation in an economy.

Indicator Methodology: Inflows of FDI as a percentage of GDP can be calculated by dividing DDC_13010 by the corresponding GDP data from DDC_10001. Similarly, inflows of FDI as a percentage of GDP can be calculated by dividing DDC_13006 by the corresponding GDP data from DDC_10001.

Part Four: SET Human Capital

R&D Personnel

IDC_3013

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: An indicator of R&D effort. Research and development personnel include all persons employed directly in R&D activities and therefore cover technicians and support staff in addition to researchers. Headcount data is used as an indicator of R&D personnel despite some personnel only working on R&D activities part-time.

Indicator Methodology: Reported as count data and collected in line with the OECD *Frascati Manual* methodology in DDC_11001.

R&D Personnel per thousand employed

IDC_3014

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001; Quarterly Labour Force Survey_DDC_10004

Comments on indicator: An indicator of R&D effort. Research and development personnel include all persons employed directly in R&D activities and therefore cover technicians and support staff in addition to researchers. Headcount data is used as an indicator of R&D personnel despite some personnel only working on R&D activities part-time. Relative size of R&D workforce expressed as ratio of R&D workers to total employment nationally.

Indicator Methodology: Calculated by dividing DDC_11001 by the corresponding total employment data from DDC_10004.

Gender of R&D Personnel

IDC_3015

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: An indicator of R&D workforce demographics. Research and development personnel include all persons employed directly in R&D activities and therefore cover technicians and support staff in addition to researchers. Headcount data is used as an indicator of R&D personnel despite some personnel only working on R&D activities part-time.

Indicator Methodology: Reported as count data and collected in line with the OECD *Frascati Manual* methodology in DDC_11001.

Researchers

IDC_3016

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: An indicator of R&D effort. Researchers are a subcomponent of R&D personnel, but are critical part of the R&D system. They are defined as professionals engaged in the conception and creation of new knowledge, products, processes, methods and systems as well as being directly involved in the management of projects. Headcount data is used as an indicator of researchers despite some personnel only working on R&D activities part-time.

Indicator Methodology: Reported as count data and collected in line with the OECD *Frascati Manual* methodology in DDC_11001.

Gender of Researchers

IDC_3017

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): R&D Survey_DDC_11001

Comments on indicator: An indicator of R&D workforce demographics. Researchers are a subcomponent of R&D personnel, but are critical part of the R&D system. They are defined as professionals engaged in the conception and creation of new knowledge, products, processes, methods and systems as well as being directly involved in the management of projects. Headcount data is used as an indicator of researchers despite some personnel only working on R&D activities part-time.

Indicator Methodology: Reported as count data and collected in line with the OECD *Frascati Manual* methodology in DDC_11001.

Availability of Graduates

IDC_2029

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Trends in Public Higher Education in South Africa Reports _DDC_19001

Comments on indicator: Availability of graduates refers to the stocks of individuals with qualifications in a particular field. An indicator of tertiary educated human resource stocks and demographics.

Indicator Methodology: A person with a first degree, an honours degree, a master's degree and a doctorate in the same field of study was counted only once in that field of study. A person who had attained qualifications in more than one field of study was counted in all the fields, Furthermore, individuals are counted according to their highest qualification in that particular field of study. Data reported by population group, gender, field of study and level of qualification.

Part Five: Technical Progress (Improvement and Innovation)

Total Factor Productivity

IDC_1039

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP) _DDC_10001; Gross Fixed Capital Investment (GFCI) by Type of Organisation_DDC_13009; Quarterly Labour Force Survey_DDC_10004; Final Supply and Use Tables_DDC_10008

Comments on indicator: Total Factor Productivity (TFP) is also called Multifactor Productivity (MFP). There are a range of methods to estimate MFP. We examine Capital-labour MFP based on value added, for an overview of alternative methods and greater methodological detail see the *OECD Productivity Manual* (OECD, 2001). OECD (2001) comments on this indicator: Capital-labour MFP indices show the time profile of how productively combined labour and capital inputs are used to generate value added. Conceptually, capital-labour productivity is not, in general, an accurate measure of technical change. The measure reflects the combined effects of disembodied technical change, economies of scale, efficiency change, variations in capacity utilisation and measurement errors (OECD, 2001: 14).

Indicator Methodology: Capital-labour MFP is calculated as the ratio of a quantity index of value added and a quantity index of combined labour and capital input:

(Quantity index of value added)

(Quantity index of combined labour and capital input)

The quantity index of value added can be calculated from DDC_10001. The quantity index of combined labour and capital input is calculated from an index of capital inputs, an index of labour inputs, and computation of shares of labour and capital in gross value added. An index of capital inputs can be calculated from DDC_13009. An index of labour inputs can be calculated from DDC_10004. Shares of labour and capital in gross value added can be calculated from DDC_10008.

Value of enterprises expenditure on innovation activities

IDC_3018

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: Enterprise expenditure on innovation is an important indicator of an innovation systems knowledge inputs. Innovation expenditure includes R&D expenditures as well as expenditures to access embodied knowledge in equipment and other external knowledge.

Indicator Methodology: Reported as count data and collected in line with the OECD *Oslo Manual* methodology in DDC_11002.

Composition of enterprises expenditures on innovation activities

IDC_3019

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: Indicator of the type of innovation system's knowledge inputs. Reported across four categories: 1) In-house R&D expenditures 2) Outsourced R&D expenditures 3) Acquisition of equipment and 4) Acquisition of other external knowledge.

Indicator Methodology: Calculated as the ratios of the value of each share by type of activity by the total value of expenditures on innovation activities as reported in line with the OECD *Oslo Manual* methodology in DDC_11002.

Domestic patent applications by country to which applied

IDC_4007

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): World Patent Report: A Statistical Review_DDC_50001; CIPRO Annual Report_DDC_20001

Comments on indicator: Patent indicators are popular measures of innovation performance. Patenting provides a long-term measure of an innovation systems knowledge outputs.

Indicator Methodology: Applicants resident in South Africa are counted as South African patents. Because patents tend to be disproportionately focused on the home market, comparison across three major patent offices internationally facilitates identification of context specific changes in patents from more systemic changes. The three patent offices used in-line with the OECD triadic patent categorisation are: the European Patent Office (EPO), the Japanese Patent Office (JPO) and the United States Patent and Trademark Office (USPTO). Data on domestic patenting is provided in DDC_20001. The other patent office data is reported in DDC_50001.

Domestic patents granted by country

IDC_4008

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): World Patent Report: A Statistical Review_DDC_50001; CIPRO Annual Report_DDC_20001

Comments on indicator: Patent indicators are popular measures of innovation performance. Patenting provides a long-term measure of an innovation systems knowledge outputs.

Indicator Methodology: Patent recipients resident in South Africa are counted as South African patents. Because patents tend to be disproportionately focused on the home market, comparison across three major patent offices internationally facilitates identification of context specific changes in patents from more systemic changes. The three patent offices used in-line with the OECD triadic patent categorisation are: the European Patent Office (EPO), the Japanese Patent Office (JPO) and the United States Patent and Trademark Office (USPTO). Data on domestic patenting is provided in DDC_20001. The other patent office data is reported in DDC_50001.

Domestic patents granted by Patent Cooperation Treaty (PCT)

IDC_4009

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): World Patent Report: A Statistical Review_DDC_50001; CIPRO Annual Report_DDC_20001

Comments on indicator: The patent cooperation treaty (PCT) procedure makes it possible to seek patent protection for an invention simultaneously in a large numbers of countries by filing a single "international" patent application. The PCT procedure has become a popular method for filing international patent applications. The PCT does not regulate patentability of the invention; questions such as what shall be patentable remain under the authority of the domestic patent office.

Indicator Methodology: Patent recipients resident in South Africa who received their patent in another country as a result of PCT are reported as a percentage of total patents granted to recipients resident in South Africa. This data is reported in DDC_50001.

Domestic trademark applications

IDC_4015

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): CIPRO Annual Report_DDC_20001

Comments on indicator: Trademark applications are an indicator of intellectual property generation.

Indicator Methodology: Trademark applications are reported in DDC_20001.

Part Six: Business Performance and Key Industrial Sectors

Labour productivity

IDC_1004

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP) _DDC_10001; Consumer Price Index (CPI)_DDC_10002; Quarterly Labour Force Survey_DDC_10004;

Comments on indicator: Labour productivity measures the difference between changes in labour inputs and the value-added of outputs. It is important to note that labour productivity conflates the influence of various other input factors such as economies of scale, capital inputs, organisational efficiency, and technological change.

Indicator Methodology: Labour productivity is calculated from data on value-added at current prices, which is reported in DDC_10001. Adjustments for the effects of inflation are made with the consumer price index DDC_10002. The constant value-added derived from these data sources is then indexed and divided by an index of total employment to give an index of labour productivity. Employment data is reported in DDC_10004.

Sectoral labour productivity growth

IDC_1005

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP) _DDC_10001; Consumer Price Index (CPI)_DDC_10002; Quarterly Labour Force Survey_DDC_10004;

Comments on indicator: This is the same as aggregate labour productivity measured in IDC_1004 but it is calculated by sector and these index values are then reported over some time period as compound average growth rates.

Indicator Methodology: Labour productivity is calculated by sector from data on value-added at current prices, which is reported in DDC_10001. Adjustments for the effects of inflation are made with the consumer price index DDC_10002. The constant value-added derived from these data sources is then indexed and divided by an index of total employment to give an index of labour productivity. Employment data is reported in DDC_10004.

Unit Labour Costs (ULC)

IDC_1006

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP) _DDC_10001; Consumer Price Index (CPI)_DDC_10002

Comments on indicator: Unit labour costs (ULC) measure the average cost of labour per unit of output. ULC thereby relate the real value of output to labour costs. Changes in ULC over time represent the difference between the change in wages and labour productivity. Trends in ULC indicate increasing competitiveness or cost pressures in an economy.

Indicator Methodology: Unit labour costs (ULCs) are calculated as the ratio of the real value of output to total labour costs. Data on the current value of output is reported in DDC_10001. Adjustments for the effects of inflation are made with the consumer price index DDC_10002. The derived constant price value-added is then divided by the compensation of employees at current prices to give the ULC ratio. Data on the compensation of employees at current prices is also reported in DDC_10001. In order to facilitate analysis of trends in ULCs they are presented as an index of the ratio in a base year.

Sectoral employment composition

IDC_1019

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: South Africa as a developing economy should distinguish between employment in the formal and informal economy. Knowledge demand is very different between these two sectors. At a very basic level the nature of innovation distinguishes these sectors. In addition, the linkages with the economy's broader system of innovation vary markedly between the sectors.

Indicator Methodology: The indicator reports the number people working in the formal, informal, domestic worker and agriculture sectors. This data is reported in DDC_10004.

Average labour absorption capacity

IDC_1020

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: The labour absorption capacity is an indicator of the employment performance of the economy.

Indicator Methodology: It is derived by taking ratio of the change in total employment and the change in the economically active population. By convention labour absorption ratio is expressed as a percentage. A labour absorptive capacity of 100% implies that every additional member of the economically active population is able to secure formal sector employment. A ratio above 100% indicates that more people are finding employment than are joining the work force. A negative ratio indicates that employment is declining in real terms. Lastly, a rate between 0% and 100% indicates that some share of new entrants to the labour force is able to find employment. This data is reported in DDC_10004.

Educational attainment of employed population

IDC_1021

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: An indicator of the existing knowledge intensity of an economy's production system.

Indicator Methodology: The skills profile of the employed population is defined across four categories of skills: 1) Those who report no formal education 2) Individuals whose highest level of completed education was between Grade 0 to Grade 6 3) Individuals who completed Grade 7 to Grade 12 4) All individuals who completed at least a diploma or certificate (tertiary graduates). This data is reported in DDC_10004.

Tertiary employed and unemployment rates

IDC_1022

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: An indicator of the economy's ability to absorb higher level skills.

Indicator Methodology: The unemployment rate of tertiary graduates is derived in a similar manner as that for the total population, but in this case it is the sum of employed and unemployed tertiary graduates upon which the rate of unemployment among tertiary graduates is derived. This data is reported in DDC_10004.

Institute for Management Development (IMD) Competitiveness Index

IDC_1040

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): World Competitiveness Yearbook_DDC_53001

Comments on indicator: A rank indicator on nations' environments to create and sustain the competitiveness of enterprises.

Indicator Methodology: A composite indicator, for details see DDC_53001.

World Economic Forum (WEF) Competitiveness Index

IDC_1041

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Global Competitiveness Reports_DDC_52001

Comments on indicator: A rank indicator on nations' competitiveness defined across a set of institutions, policies, and factors that influence the level of productivity of a country.

Indicator Methodology: A composite indicator, for details see DDC_52001.

Venture capital intensity

IDC_2028

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): No internationally comparable databases in South Africa identified.

Comments on indicator: Venture capital is provided by specialised financial firms acting as intermediaries between primary sources of finance (such as pension funds or banks) and firms (formal venture capital). Data on venture capital are collected by venture capital associations from their members. In South Africa, no institutional source of such data was identified in this study.

Indicator Methodology: When data is available, total venture capital investments are usually expressed as a ratio of GDP. Differentiation between early stage venture capital and expansionary venture capital is also made as a ratio of GDP where information is available. Sectoral composition of venture capital as a percentage of total venture capital investments is also made where data permits.

Source of government support (Innovative enterprises)

IDC_3020

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An indicator of sources and effectiveness of government support for innovation from enterprises that report innovations,

Indicator Methodology: Calculated as a percentage of total expenditures on innovation across five tiers of government in line with the OECD *Oslo Manual* methodology in DDC_11002.

Gross fixed capital investment (GFCI)

IDC_3021

Associated Database(s): Gross Fixed Capital Investment _DDC_13005; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator Business investment could lead to greater innovation as a result of the diffusion of new equipment. Gross fixed capital investment (GFCI) is therefore an indicator of knowledge inputs to an innovation system. However, only part of gross fixed capital investment contains an innovative component.

Indicator Methodology: Gross fixed capital investment (GFCI) is reported by sector and by type of investment. There are six types of capital investments: 1) residential buildings, 2) non-residential buildings, 3) construction works, 4) transport equipment, 5) machinery and other equipment, and 6) transfer costs. This data is reported in DDC_13005. The relative significance of gross fixed capital investment over time is reported as a percentage of GDP at current prices. GDP data is available in DDC_10001.

Inward FDI stock

IDC_3022

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Foreign liabilities: Direct investment by source_DDC_13006; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator: Foreign direct investment (FDI) is an investment involving a long-term relationship and reflecting a lasting interest and control by an entity in one economy (foreign direct investor or parent company) in an enterprise resident in another economy. Therefore, increases in FDI may represent production shifts towards higher value-added goods and increased production efficiency.

Indicator Methodology: FDI stock data as a percentage of GDP is used as an indicator of the rate of FDI saturation in an economy. Total stocks inward FDI are reported in DDC_13006. In order to express the relative significance of FDI stocks they are reported as a percentage of GDP at current prices. This GDP data is reported in DDC_10001.

Sectoral composition of inward FDI stock

IDC_3023

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Foreign liabilities: Direct investment by source_DDC_13006; Gross Domestic Product (GDP) _DDC_10001

Comments on indicator: The sectoral composition of FDI indicates the structure and changes in composition of long-term investments.

Indicator Methodology: Total stocks of inward FDI are reported across three sectors: 1) public corporations, 2) banking, and 3) private non-banking in DDC_13006. These components are reported as percentage shares of total inward FDI stocks.

Percentage of enterprises with innovation activities

IDC_4001

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An important indicator of knowledge outputs from a system of innovation,

Indicator Methodology: Calculated as a percentage of enterprises with some innovation during the period in comparison to the population of enterprises. Enterprises with innovations also report composition of those innovations across four categories of innovation: 1) Product innovations 2) Process innovations 3) marketing innovations 4) organisational innovations. Data reported in DDC_11002.

Type of enterprises innovations

IDC_4002

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An indicator of the nature of innovations occurring in the production system,

Indicator Methodology: Calculated as a percentage of enterprises with some innovation during the period in comparison to the population of enterprises. Enterprises with innovations also report composition of those innovations across four categories of innovation: 1) Product innovations 2) Process innovations 3) marketing innovations 4) organisational innovations. Data reported in DDC_11002.

Type of organisational/marketing innovations in enterprise with them

IDC_4003

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An indicator of the nature of organisational and/or marketing innovations occurring in the production system,

Indicator Methodology: Calculated as a percentage of all organisational/marketing innovations in enterprises with them across five categories. Data reported in DDC_11002.

Important outcomes of innovation for enterprises

IDC_4004

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An indicator of the nature of innovations impacts for the enterprise with the innovation.

Indicator Methodology: Reported across nine categories of impacts as a percentage of all reported impacts by enterprises with innovations. Data reported in DDC_11002.

Total turnover of enterprises with goods & service (product) innovations

IDC_4005

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An indicator of the size of enterprise who report product innovations.

Indicator Methodology: Calculated as total nominal Rand value of turnover. Data reported in DDC_11002.

Share of turnover from product innovations

IDC_4006

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An indicator of the relative contribution of innovations to total enterprise turnover by enterprise reporting product innovations.

Indicator Methodology: Calculated as the percentage of turnover attributable to product innovations new to the market, turnover attributable to innovations new to the enterprise, and turnover which has been unchanged by product innovations. total nominal Rand value of turnover. Data reported in DDC_11002.

Annual registration of enterprises by type

IDC_4010

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): CIPRO Annual Report_DDC_20001

Comments on indicator: The creation of new businesses and the closure of failing businesses is a potential source of economic dynamism; entry, exit, and turnover of firms are important indicators of entrepreneurship in an economy. Change in net creation firms measures an economy's ability to expand and transform the boundaries of economic activity to meet changing needs.

Indicator Methodology: The registration of enterprises by three categories: 1) Close corporations, 2) Private Companies, and 3) Other Enterprises is used as an indicator of firm entry. This data is reported in DDC_20001.

Type of registered enterprises

IDC_4011

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): CIPRO Annual Report_DDC_20001

Comments on indicator: The creation of new businesses and the closure of failing businesses is a potential source of economic dynamism; entry, exit, and turnover of firms are important indicators of entrepreneurship in an economy. Change in net creation firms measures an economy's ability to expand and transform the boundaries of economic activity to meet changing needs.

Indicator Methodology: The nature of registered enterprises by seven categories is used as an indicator of firm composition and associated dynamics. This data is reported in DDC_20001.

Innovative Enterprises who used IPRs

IDC_4014

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An indicator of the relative importance of intellectual property rights (IPRs) to enterprises who reported innovations. As such, indicates the relative openness of an innovation system and the strength of its IPRs.

Indicator Methodology: Calculated as the percentage of firms reporting innovations who also reported the use of IPRs in association with those innovations. Data reported in DDC_11002.

Sources of innovation in innovative enterprises

IDC_5004

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An important indicator of the structure of knowledge flows in an innovation system.

Indicator Methodology: Calculated as the percentage of enterprises in total and by two sub-sectors (service & industrial sectors) who identify the source of their innovation across three categories: 1) other enterprises 2) own enterprise in collaboration and 3) mainly own enterprise. Data reported in DDC_11002.

Important information sources in innovative enterprises

IDC_5005

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An important indicator of the structure of knowledge flows in an innovation system.

Indicator Methodology: Calculated as the percentage of enterprises identifying one of ten sources of information as being important for their innovation. Data reported in DDC_11002.

Important factors hindering innovation

IDC_5006

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An important indicator of the barriers to knowledge flows in an innovation system.

Indicator Methodology: Calculated as the percentage of enterprises identifying one of eight factors as hindering innovation. Data reported in DDC_11002.

Collaborative partners for innovative activities

IDC_5007

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Innovation Survey_DDC_11002

Comments on indicator: An important indicator of the nature of collaborative networks in an innovation system.

Indicator Methodology: Calculated as the percentage of enterprises identifying one of seven collaborative partners in their innovative activities. Data reported in DDC_11002.

Part Seven: Quality of Life

GDP per capita

IDC_1001

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP) _DDC_10001; Consumer Price Index (CPI)_DDC_10002; Mid-Year Population Estimates_DDC_10003

Comments on indicator: The value of production (GDP) per capita is an indicator of an economy's level of technological sophistication.

Indicator Methodology: GDP at current prices is reported in DDC_10001. This GDP data is adjusted for inflation using a consumer price index (CPI) reported in DDC_10002. Lastly, the inflation adjusted economic outputs are converted to a per capita figure by dividing by the economies' populations. Population data is reported in DDC_10003.

Provincial GDP

IDC_1002

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP) _DDC_10001; Consumer Price Index (CPI)_DDC_10002;

Comments on indicator: The value of production (GDP) per province is an indicator of their relative technological sophistication. It also indicates absolute and relative changes in this sophistication over time.

Indicator Methodology: Provincial GDP at current prices is reported in DDC_10001. This GDP data is adjusted for inflation using a consumer price index (CPI) reported by province in DDC_10002.

Percentage of working-age involved in unpaid community work

IDC_1023

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Quarterly Labour Force Survey_DDC_10004

Comments on indicator: The percentage of working-age involved in unpaid community work is an indicator of social cohesion. A socially inclusive society, with low rates of income inequality and poverty and a highly educated population could support innovation by increasing the purchasing power of the population, increasing the pool of individuals with capital and education to invest in risk taking innovative projects, and increasing the pool of skilled, educated and committed workers. In addition, social cohesion is an indicator of social capital that can support collaboration in innovation.

Indicator Methodology: The percentage of the working aged working-age involved in unpaid community work is reported in DDC_10004.

Voter participation as a percentage of registered voters

IDC_1024

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Municipal Elections Reports_DDC_22001; National and Provincial Elections Reports_DDC_22002

Comments on indicator: Voter participation is an indicator public engagement and social cohesion. A socially inclusive society, with low rates of income inequality and poverty and a highly educated population could support innovation by increasing the purchasing power of the population, increasing the pool of individuals with capital and education to invest in risk taking innovative projects, and increasing the pool of skilled, educated and committed workers. In addition, social cohesion is an indicator of social capital that can support collaboration in innovation.

Indicator Methodology: Voter participation as a percentage of registered voters is reported in DDC_22001 and DDC_22002.

Energy intensity of value added

IDC_1025

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP)_DDC_10001; Consumer Price Index (CPI)_DDC_10002; Electricity Generated and Available for Distribution_DDC_10005

Comments on indicator: Natural resource endowments are important determinants of an innovation system's structure. An indicator of an innovation system's development can be the extent to which natural resources are extracted or protected. As such, energy intensity of value added is an indicator of resource demand and associated knowledge intensity.

Indicator Methodology: This indicator is derived by dividing the constant Rand value added of production by the number of watt hours consumed. Rand value added at current prices is reported in DDC_10001. This value-added data is adjusted for inflation using a consumer price index (CPI) reported in DDC_10002. Lastly, the inflation adjusted economic outputs is divided by energy consumption, which is reported in DDC_10005.

Mineral output

IDC_1027

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Minerals Bulletin_DDC_16001

Comments on indicator: Mineral outputs resources are an indicator of the dynamics of natural resource endowments. As natural resource endowments are important determinants of an innovation system's structure. Mineral resource extraction is an indicator of an innovation system's development.

Indicator Methodology: This indicator is reported in DDC_16001.

Mineral resources

IDC_1028

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Minerals Bulletin_DDC_16001

Comments on indicator: Mineral resources are an indicator of stocks of natural resource endowments. As natural resource endowments are important determinants of an innovation system's structure. Mineral resource stocks are an indicator of an innovation system's development.

Indicator Methodology: This indicator is reported in DDC_16001.

Medical Aid Coverage

IDC_1031

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: Poverty is an important determinant of an innovation systems structure. An indicator of an innovation system's development can be the extent to which poverty exists in an economy and the groups most severely impacted by it. Medical aid coverage is an indicator of poverty.

Indicator Methodology: This indicator is reported on a percentage basis by population group in DDC_10006.

Household amenities

IDC_1032

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: Poverty is an important determinant of an innovation systems structure. An indicator of an innovation system's development can be the extent to which poverty exists in an economy and the groups most severely impacted by it. Households with water on site, electricity, and toilets are indicators of poverty.

Indicator Methodology: This indicator is reported on a percentage basis by households with these amenities in DDC_10006.

Childhood malnutrition

IDC_1033

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: Poverty is an important determinant of an innovation systems structure. An indicator of an innovation system's development can be the extent to which poverty exists in an economy and the groups most severely impacted by it. Childhood malnutrition is an indicator of poverty.

Indicator Methodology: This indicator of the percentage of households in which a child was reported to have gone hungry in the past year is reported on a percentage basis in DDC_10006.

Infant mortality

IDC_1034

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: Poverty is an important determinant of an innovation systems structure. An indicator of an innovation system's development can be the extent to which poverty exists in an economy and the groups most severely impacted by it. Infant mortality is an indicator of poverty.

Indicator Methodology: This indicator of infant deaths per 1,000 live births is reported in DDC_10006.

Structural types of households

IDC_1035

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: Poverty is an important determinant of an innovation systems structure. An indicator of an innovation system's development can be the extent to which poverty exists in an economy and the groups most severely impacted by it. Households without formal structure can be an indicator of poverty.

Indicator Methodology: This indicator is reported on a count basis of households being classified as: 1) formal structure, 2) informal dwellings, 3) traditional dwellings, and 4) other dwellings in DDC_10006.

Income inequality (Gini-Coefficient)

IDC_1036

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Income and Expenditure Survey_DDC_10007

Comments on indicator: Income distribution is an indicator of inequality in an economy. Inequality is commonly associated with poverty. Poverty is an important determinant of an innovation systems structure. An indicator of an innovation system's development can be the extent to which poverty exists in an economy and the groups most severely impacted by it. The Gini-Coefficient is an indicator of inequality.

Indicator Methodology: The gini-coefficient can assesses income inequality across all households in a number that ranges between zero and one. If each household shared an equal proportion of the economies total wealth the Gini coefficient would equal zero. As a greater percentage of the economies wealth diverges from equality and the wealthiest households hold a greater proportion of the total wealth the gini-coefficient moves from zero towards one. In the extreme if all the economies wealth was held by the single richest household the gini-coefficient would equal one. The data which reports the percentage of income held by the richest and poorest percentiles of households is reported in DDC_10007.

Income inequality (Lorenz curve)

IDC_1037

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Income and Expenditure Survey_DDC_10007

Comments on indicator: Income distribution is an indicator of inequality in an economy. Inequality is commonly associated with poverty. Poverty is an important determinant of an innovation systems structure. An indicator of an innovation system's development can be the extent to which poverty exists in an economy and the groups most severely impacted by it. The Lorenz curve is an indicator of inequality.

Indicator Methodology: The Lorenz curve is a graphical representation of income inequality across all households. With the cumulative percentage of income forming the y- axis and the cumulative percentage of households forming the x- axis, the Lorenz curve graphs the correspondence between the cumulative percentage of households and their respective cumulative percentage of income. If each household shared an equal proportion of the economies total wealth the Lorenz curve would form a straight line at 45 degrees from the origin. As a greater percentage of an economies wealth diverges from equality, that is the wealthiest households hold a greater proportion of total wealth, the Lorenz curve diverges from the equality line towards the x-axis. The greater the divergence from the equality line to the x-axis, the greater the inequality. The data which reports the percentage of income held by the richest and poorest percentiles of households is reported in DDC_10007.

Human Development Index (HDI)

IDC_1038

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP)_DDC_10001; Consumer Price Index (CPI)_DDC_10002; Mid-Year Population Estimates_DDC_10003; General Household Survey_DDC_10006; EMIS_DDC_12001; Foreign exchange rate: SA cent per USA dollar Middle rates_DDC_13004; US Consumer Price Index_DDC_54001

Comments on indicator: The human development index (HDI) is a composite indicator used to rank nations' human development. It assesses average achievement of each nation across three basic dimensions of human development: 1) A long and healthy life, measured by life expectancy at birth, 2) Knowledge, measured as an index of educational attainment indicators, 3) A decent standard of living, measured by GDP per capita in purchasing power parity (PPP) terms in US dollars. As such the HDI is an absolute and relative indicator of poverty in a nation.

Indicator Methodology: The HDI value ranges between zero and one, with zero forming the minimal human development performance value and one forming the maximum human development performance value. The HDI also serves as the basis of the international HDI rankings. The HDI value is calculated as the weighted average of the three basic dimensional measures: 1) life expectancy index 2) education index 3) GDP index or $HDI = 1/3(\text{life expectancy index}) + 1/3(\text{education index}) + 1/3(\text{GDP index})$.

The life expectancy index is calculated as a value between zero and one similar to the aggregate HDI index. As such the actual life expectancy at birth in South Africa is subtracted from the minimal value, 25 years in the most recent edition (UNDP, 2007). That numerator of actual life expectancy less 25 years is then divided by the difference between the goalpost maximum value for life expectancy 85 years and the minimum value 25 years:

$$\frac{(\text{Actual Life Expectancy at Birth in South Africa} - 25)}{(85-25)}$$

South African life expectancy at birth data is available in DDC_10003.

The education index is calculated as the weighted average of an adult literacy index and a gross enrolment index. However a two-thirds weighting is given to adult literacy and the remainder to the gross enrolment index or Education index = $2/3(\text{adult literacy index}) + 1/3(\text{gross enrolment index})$. The adult literacy index is also a dimension index ranging between zero and one, the minimal value being zero percent adult literacy and the maximum value being one hundred percent adult literacy:

$$\frac{(\text{Actual adult literacy rate in South Africa} - 0)}{(100-0)}$$

South African adult literacy rate is available in DDC_10006 and discussed above in IDC_2003.

The gross enrolment index is also a dimension index, the minimal value being a zero percent gross enrolment ratio and the maximum value being a one hundred percent gross enrolment ratio:

$$\frac{(\text{Gross enrolment ratio in South Africa} - 0)}{(100-0)}$$

The South African gross enrolment ratio is calculated by dividing the number of learners enrolled all levels of education, regardless of age, by the total population between the school enrolment age and five years after school leaving age (5- 20). Total headcount of enrolments are available in DDC_12001 and the population data from DDC_10003.

The GDP index, a dimension index, is calculated as the log base ten of South African GDP per capita in PPP US\$ less the minimal value, \$100, also as the log base ten then divided by the difference between the goalpost maximum value for GDP per capita \$40,000 log base ten and the minimum value \$100 log base ten:

$$\frac{(\text{Log}_{10}(\text{PPP US\$ GDP per capita in South Africa}) - \text{Log}_{10}(100))}{(\text{Log}_{10}(40,000) - \text{Log}_{10}(100))}$$

Aggregate South African GDP is available in DDC_10001. It can be converted to US\$ PPP by first deriving an implied PPP exchange rate between the Rand and the US\$. This can be done by deriving PPP index which is calculated by dividing the South African consumer price index (CPI) by the US CPI with a base year in which the exchange rate was not over or under valued. Data for the two CPIs can be found in DDC_10002 and DDC_54001 respectively. The PPP index is then multiplied by the nominal exchange rate in the base year to derive the PPP exchange rate. Rand to US\$ nominal exchange rate data can be found in DDC_13004. The PPP exchange rate is then used to convert aggregate South African GDP in Rand to a PPP US\$ value. Lastly, the aggregate PPP US\$ value of South African GDP is divided by South Africa's total population to derive PPP US\$ GDP per capita in South Africa. South African population data is available in DDC_10003. For further details on PPP calculation see Mohr (2005: 151-154).

Households with access to a telephone (fixed or cellular)

IDC_2021

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): General Household Survey_DDC_10006

Comments on indicator: Information and communication technologies (ICT) are important means to enable knowledge growth and development. Telephones are a basic ICT, facilitating knowledge and information transfers in a society.

Indicator Methodology: This indicator is reported as the ratio of the number of households reporting to have a cellular or fixed-line telephone to the total number of households. Data is available in DDC_10006.

Part Eight: Wealth Creation

Value-added by sector

IDC_1003

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Gross Domestic Product (GDP) _DDC_10001; Consumer Price Index (CPI) _DDC_10002;

Comments on indicator: There are differences across sectors in their demand for goods and services. Similarly, the nature and intensity of knowledge demand varies among sectors. Sectoral shares of value-added indicate the relative importance of various sectors' knowledge demand in an economy. In addition, relative changes in sectoral shares over time indicate shifts in demand.

Indicator Methodology: The indicator is obtained from data on value-added at current prices, which is reported in DDC_10001. This value-added data is adjusted for inflation using a consumer price index (CPI) reported in DDC_10002.

Technological composition of manufacturing exports

IDC_1007

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Trade Data by Country and Region_DDC_14001; Consumer Price Index (CPI) _DDC_10002;

Comments on indicator: Exports of technologically intensive goods are a measure of an economy's knowledge intensity and demand. While all industries generate and/or exploit new technology and knowledge, some are more knowledge-intensive than others.

Indicator Methodology: This indicator reports manufacturing exports according to technological intensity. Classification follows OECD guidelines (Hatzichronoglou, 1997). Technological intensity is differentiated across four levels: 1) high-technology 2) medium-high- technology 3) medium-low technology 4) low-technology. Each level is specified in accordance with the 3rd revised International Standard Industrial Classification (ISIC) system. This data is available in DDC_14001.

Export values

IDC_1008

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Trade Data by Country and Region_DDC_14001; Consumer Price Index (CPI)_DDC_10002;

Comments on indicator: Changes in the absolute and relative share of technologically intensive goods can indicate that an economy is increasing its demand for knowledge.

Indicator Methodology: This indicator reports manufacturing exports according to technological intensity. Classification follows OECD guidelines (Hatzichronoglou, 1997). Technological intensity is differentiated across four levels: 1) high-technology 2) medium-high- technology 3) medium-low technology 4) low-technology. Each level is specified in accordance with the 3rd revised International Standard Industrial Classification (ISIC) system. This data is available in DDC_14001. Adjustments for the effects of inflation are made with the consumer price index (CPI). This data is reported in DDC_10002.

Contributions to South Africa's manufacturing trade balance

IDC_1009

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Trade Data by Country and Region_DDC_14001

Comments on indicator: Contribution to South Africa's manufacturing trade balance is an indicator of revealed comparative advantage and thereby facilitates a better understanding of an economy's underlying knowledge intensity in manufacturing.

Indicator Methodology: The indicator is calculated according to the following formula:

$(X_i - M_i) - (X - M)[(X_i + M_i)/(X + M)]$ where $(X_i - M_i)$ = actual industry trade balance, and $(X - M)[(X_i + M_i)/(X + M)]$ = theoretical trade balance

If an industry had no comparative advantage or disadvantage, its share of the total trade balance would equal its share of total trade. The contribution to the balance of trade then is the difference between the actual and theoretical balance. A positive contribution indicates a structural surplus and a negative contribution indicates a structural deficit. This contribution is then expressed as a percentage of the total manufacturing trade. This data is available in DDC_14001.

Industries' comparative advantage by Level of Technology

IDC_1010

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Trade Data by Country and Region_DDC_14001

Comments on indicator: Revealed comparative advantage in South Africa's manufacturing trade balance facilitates a better understanding of an economy's underlying knowledge intensity in manufacturing.

Indicator Methodology: The indicator is calculated according to the following formula:

$(X_i - M_i) - (X - M)[(X_i + M_i)/(X + M)]$ where $(X_i - M_i)$ = actual industry trade balance, and $(X - M)[(X_i + M_i)/(X + M)]$ = theoretical trade balance

If an industry had no comparative advantage or disadvantage, its share of the total trade balance would equal its share of total trade. The contribution to the balance of trade then is the difference between the actual and theoretical balance. A positive contribution indicates a structural surplus and a negative contribution indicates a structural deficit. This contribution is then expressed as a percentage of the total manufacturing trade. This data is available in DDC_14001.

Traded share of the economy

IDC_1011

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Trade Data by Country and Region_DDC_14001

Comments on indicator: The traded share of an economy is an indicator of its involvement in international trade. This involvement in international trade suggests the openness of the economy to the foreign sector. In terms of knowledge demand, a relatively open economy is assumed to be associated with a more competitive market environment that in turn acts as an incentive for innovation among domestic firms.

Indicator Methodology: The traded share of the economy is measured as the sum of all trade in an economy (imports + exports) as a percentage of GDP. South African export and import data is available in DDC_14001 and GDP data in DDC_10001.

Stock of FDI assets by geographic area of origin (outflows)

IDC_5002

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Foreign assets: Direct investment by select countries and continents_DDC_13007

Comments on indicator: Stocks of FDI assets can be used to identify the geographic destination of investment, which serves as an indicator of investment networks and associated knowledge circulation in a system of innovation.

Indicator Methodology: Stocks of FDI assets by geographic area are reported in DDC_13007.

Stock of FDI liabilities by geographic area of destination (inflows)

IDC_5003

Date of this info: 25/03/09

Alternative indicator descriptor: None

Associated Database(s): Foreign liabilities: Direct investment by select countries and continents _DDC_13008

Comments on indicator: Stocks of FDI liabilities can be used to identify the geographic sources of investment, which serves as an indicator of investment networks and associated knowledge circulation in a system of innovation.

Indicator Methodology: Stocks of FDI liabilities by geographic area are reported in DDC_13008.

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