

Chapter 12

Government budget allocations for R&D

This chapter presents an approach for measuring government funding of R&D using data from government budgets. This type of funder-based approach for reporting R&D involves identifying all the budget items that may support R&D activities and measuring or estimating their R&D content. Advantages of this approach include the ability both to report significantly more timely government R&D funding totals since they are based on budgets and to link these totals to policy considerations through classification by socioeconomic objectives.

The definitions discussed in this chapter are, as far as possible, compatible with the international methodologies and guidelines contained in the IMF's Government Finance Statistics Manual (GFS) of 2014 and the 2008 System of National Accounts, as well as the methodologies developed by Eurostat such as the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets (NABS).

12.1. Introduction

12.1 There are different ways of measuring how much governments spend on R&D. The performer-based approach recommended in Chapter 4 is to survey the resident units that perform R&D (businesses, institutes, universities, etc.) in order to identify the amount spent on intramural R&D performance in a reference year. It is then possible to identify the portion of the intramural R&D expenditure funded by government (Chapter 4, Table 4.4). These totals provide an accurate measure of government funding for intramural R&D performed in the economy as a fraction of gross domestic expenditure on R&D (GERD). The disadvantages are that it takes time for this information to become available and that R&D performers are not necessarily able to link the government funding they receive to policy objectives.

12.2 A complementary approach for measuring government funding of R&D has been developed using data from budgets. This type of funder-based approach for reporting R&D involves identifying all the budget items that may support R&D activities and measuring or estimating their R&D content. Advantages of this approach include presumably the ability both to report significantly **timelier** government R&D totals since they are based on budgets and to link the R&D totals to policy considerations through classification by **socioeconomic objectives** (Section 12.4 below).

12.3 The specifications of such budget-based data are described in this chapter and were first introduced in this manual's third edition. In more recent editions, budget-based data have been formally referred to as "government budget appropriations or outlays for R&D" (GBAORD), a term that is replaced in this edition with the simpler term of Government budget allocations for R&D (GBARD).

12.4 The definitions discussed in this chapter are, as far as possible, compatible with the international methodologies and guidelines contained in the IMF's *Government Finance Statistics Manual* (GFS) of 2014 and the 2008 System of National Accounts, as well as the methodologies developed by Eurostat such as the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets (NABS).

12.2. The scope of GBARD

Relevant government units within the scope of GBARD

12.5 As specified in Chapter 3 (Section 3.5) and elaborated upon in Chapter 8, the Government sector comprises the central (federal) government,

regional (state) government and local (municipal) government subsectors. The focus of GBARD statistics is on the R&D expenditure operations conducted by the government at all these levels and financed through the budget under standard budgetary approval procedures. To minimise the potential reporting burden and ensure timeliness, local government budget funds may not be included if their contribution is not deemed to be significant or if the data cannot be collected.

12.6 As noted in the System of National Accounts and the IMF *Government Finance Statistics Manual*, the budgetary central (federal) government is often a single unit of the central government that encompasses the fundamental activities of the national executive, legislative and judiciary powers. This component of general government is usually covered by the main (or general) budget. The budgetary central government's revenue and expense are normally regulated and controlled by a ministry of finance, or its functional equivalent, by means of a budget approved by the legislature (IMF, 2014: para. 2.81).

12.7 At a given level of government, ministries, departments, agencies, boards, commissions, judicial authorities, legislative bodies and other entities that make up a government rarely have the authority to own assets, incur liabilities or engage in transactions in their own right. In general, all entities the operations of which are funded as a result of appropriations made in accordance with a budget controlled by the legislature are not separate institutional units and are treated as a single statistical unit.

12.8 General government entities with individual budgets not fully covered by the general budget are considered extra-budgetary (see Chapter 8) and are included for the purpose of GBARD measurement. The budgetary arrangements for these entities vary widely across countries, and various terms are used to describe them, but they are often referred to as "extra-budgetary funds" or "decentralised agencies" (IMF, 2014).

12.9 GBARD encompass all spending allocations met from sources of government revenue foreseen within the budget, such as taxation. Spending allocations by extra-budgetary government entities are within the scope only to the extent that their funds are allocated through the budgetary process. Likewise, R&D funding by public (business) enterprises is outside the scope of GBARD statistics, as it is based on funds raised within the market and outside the budgetary process. Only in the exceptional case of budgetary provisions for R&D to be carried out or distributed from public enterprises should this be counted as part of GBARD. This manual does not define what spending concepts should be used, since they vary across countries. Some countries will report on outlays, others on budget authorisations, and still others on budget obligations. It is important that whatever concept is used, it is consistently used in the compilation of GBARD totals.

Definition and identification of R&D in GBARD

12.10 The definition of R&D is given in Chapter 2. As already noted, the SNA 2008 and GFS 2014 – the core statistical frameworks for government and public sectors statistics – use the definitions in the previous edition of this manual, which are essentially the same as those in Chapter 2 of this edition.

12.11 Basic research, applied research and experimental development are all included but are not identified separately for the purposes of GBARD compilation. Likewise, the analysis for budgetary data on R&D covers natural sciences and engineering and social sciences, humanities and the arts.

12.12 As far as possible, all guidelines and conventions listed in Chapter 2 for distinguishing R&D from non-R&D activities should be applied. Particular care should be taken to check the R&D content of budget items that are officially described as “science and technology activities”, “development contracts” or the “purchase of prototypes”, as discussed in Chapters 2, 4 and 7, as well as other science, technology and innovation expenditures, which some countries may identify as, or combine with, R&D expenditures in their presentation of general budget data.

12.13 Compilers of GBARD statistics may need to develop a set of coefficients according to discipline, institution, other criteria or a mixture of these in order to determine the proportion of R&D in non-exclusive budget items, including for a range of institutions that also perform activities other than R&D. As far as possible, these coefficients should be consistent with what is reported by these institutions as R&D in performer-based surveys. The information on coefficients should be made available to users as openly as possible in order to facilitate review and updates.

12.14 Government budgets for R&D may include a provision for the costs of administering R&D programmes and projects, including for example the formulation of calls, competitive procurement processes and grant solicitations, as well as the monitoring and evaluation of programmes. In principle, GBARD should cover only the funding of R&D performance. It is, however, acknowledged that such delivery costs can be an integral part of the process required to ensure that the funds are used for R&D and for meeting the government’s objectives, and these can also be difficult to separate, particularly in the budgetary stages. This is one potential source of divergence between performer-based and government-based estimates of R&D support by government (see Section 4.4 in Chapter 4). For this reason, when information is available, it would be helpful to use it to report on the potential magnitude of R&D administration funds.

Types of R&D expenditures covered by GBARD data

Types of costs

12.15 GBARD includes in principle both funding for current costs and capital expenditures. A major difference with finance statistics is that government expenses will include a depreciation-based component, while the presentation

of the budget may report capital expenditures separately. The recommendations made in Chapter 4 concerning the treatment of capital expenditures that are intended to avoid double counting also apply in the context of GBARD statistics. Another factor to take into account is that funders and performers may have different perspectives on what constitutes capital expenditure.

Types of fund recipients

12.16 GBARD covers not only government-financed R&D that is performed in government entities but also government-financed R&D in the three other sectors comprising the domestic economy (Business enterprise, Higher education and Private non-profit) as well as in the Rest of the world (including international organisations). GBARD should therefore not be confused with Government intramural R&D expenditures (GOVERD). As noted in Chapters 4 and 8, not all GOVERD is necessarily financed by government.

12.17 Budget allocations may be made for institutions that are not necessarily performers of R&D. A large component of government R&D budgets may be assigned to institutions such as agencies or organisations that have the specific responsibility of allocating R&D funds to performers or other intermediary agencies in line with their stated responsibilities. The level of detail available in the general budget of a central, regional or local government will therefore not necessarily allow GBARD data compilers to identify the ultimate use of the funds. In contrast, the budget statements of these intermediary agencies, within or outside government, may comprise additional detail, including possibly the identity of the final beneficiaries of financial support for R&D. Such beneficiaries may also subcontract some of the R&D activities.

12.18 A number of departments and agencies can play a role in distributing and allocating budgetary funds to other public or private organisations. It is not envisaged that GBARD is used to report for subsets of government, but due care should be exercised for example to:

- remove central (federal) government allocations to regional (state) or local (municipal) budgets in compiling GBARD estimates at the state level, if those have already been taken into account at the level of central government
- avoid the risk of double counting or undercounting when constructing GBARD statistics based on separate reports from central government agencies and departments.

Government funding of R&D in the Rest of the World

12.19 Government R&D budgets may include the provision of R&D funding to non-resident institutions. In the case of GBARD funds for R&D in the Rest of the world, only contributions to international R&D programmes or organisations solely or mainly concerned with R&D should be included. General standing contributions to the general budget (such as those to international organisations or the European Union) should be excluded unless a defined component is

specifically designated for R&D activities. The complementary guidance in the online annexes to this manual available at <http://oe.cd/frascati> may in the future provide an illustrative list of such international organisations with particularly high levels of R&D intensity. This subject is covered in more detail in Chapter 11 on R&D globalisation.

Types of R&D support mechanisms and their treatment in GBARD statistics

Government funds for government intramural R&D

12.20 The concept of government support for R&D performed within the Government sector has been covered in Chapter 8. From the perspective of GBARD statistics, the main challenge arises in the case of budgetary approvals for R&D performed by government institutions but expected to be financed from other sources. In some countries, these may be included in the government budget, on the grounds that the agency concerned needs government permission to spend them (gross approach). In others, they may be excluded (net approach). When dealing with these government funds, a distinction should be made between:

- a) Contracts or grants from other sectors for the performance of R&D by government institutions. These do not represent government budget allocations for R&D.
- b) Other government funds, such as receipts from general levies that have a status comparable to tax or other budget-based government financing. These do fall within the scope of government budget allocations for R&D.

12.21 Budgeted amounts for which corresponding revenue is expected from non-budgetary sources should be excluded from GBARD according to the net principle. For example, if the general budget shows that a government R&D institute has a total gross budget of 10 million (including 3 million for externally financed contract research), only 7 million should be counted as net budgetary appropriations for the institute, since the 3 million is in the budget of the funder of the contract research.

Provision of infrastructure and services for R&D performed by third parties

12.22 Some examples of government units providing such services have been discussed in Chapter 8, in particular with regard to whether this represents performance of R&D within government. The services provided by the government facilities may be partly subsidised through government budgetary funding, according to the difference between the economic cost of the service provided by government units and any fees or prices paid by the user that is carrying out the R&D, in line with the net principle. The cost of the service may comprise both the operating cost and the opportunity cost of the resources used by the infrastructure assets. In some cases, fees may also extend to cover for the

depreciation and financing costs of the infrastructure. For GBARD statistics, it is recommended that:

- The budgetary funding for acquiring or building the R&D equipment by government should be counted as GBARD, and separately itemised if possible. Most budget documents separate current and capital investments. Capital investments of this type can be lumpy, particularly if the assets are to be used over a long period of time and may distort comparisons if the capital investments are not taken into account when comparisons are made.
- The infrastructure's operating and maintenance costs, net of usage fees, etc., should be counted as GBARD on an ongoing basis, as long as this cost is recognised in the budget.
- The infrastructure's depreciation and financing costs should be excluded, if possible, to avoid double counting. For some purposes, it could be of value to report those separately.

12.23 The same principles can be applied when the infrastructure is developed and/or operated by a third party, to the extent that it is possible to identify the R&D component and confirm the budgetary intention.

Payments for R&D services

12.24 Paying for R&D services provided by third parties may result in the government securing economic and legal rights, not necessarily exclusive, on the outcomes of the R&D. This corresponds to the procurement of R&D services, typically described as contracts for R&D services, or R&D procurement. R&D procurement represents an exchange rather than a transfer, as is defined in Chapter 4. R&D procurement may be subject to specific rules and carried out on a commercial or pre-commercial basis. Both forms should be considered as part of GBARD as long as it is part of the budget.

12.25 Payments made under R&D contracts may include a profit and/or subsidy component. The full value of the payments should be counted as GBARD, even though this will accentuate the difference with performer-based estimates, which should in principle exclude the profit component. Payments for goods and services that incorporate or anticipate R&D activities should not be considered as GBARD unless the R&D component can be identified and isolated in the budget and payments are made specifically for the delivery of the R&D component.

R&D grants

12.26 Governments can provide funding for R&D by firms or other types of organisations without requiring any significant rights on the outputs/outcomes of the project or without specifying a product or service as a requirement for the funds provided. These transactions are transfer payments, and are often described as R&D subsidies or grants. A formal agreement is likely to underpin such grant agreements, which may also foresee milestones and deliverables as

conditions for the payment to be made or, if the conditions are not met, for it to be returned. Grants are part of GBARD as long as these are in the budget. Grants can be provided to cover operating and capital costs. Governments may also provide grants for units in other sectors to deliver services or access to infrastructure or to transfer capital assets for R&D performers to use.

12.27 Public general university funds (GUF) represent a particular type of government transfer mechanism for R&D. GUF (see Chapters 4 and 9) represent an exception to the direct support rule applied in R&D statistics, as higher education institutions (HEIs) have a significant degree of discretion on the use of block grant funding received from governments. On the other hand, these block grants (most often) take place in the context of transactions between governments and HEIs that are partly controlled by the governments, and hence it may be legitimate to consider them as direct funding. In some countries, government may provide block or institutional funding similar to GUF. Funds are sometimes provided to institutions in sectors other than Higher education for general purposes, which recipients can but are not obliged to use for R&D purposes. The only type of general block or institutional funding captured by GBARD is GUF for those countries where these funds apply.

12.28 On a practical basis, budget documents do not provide, by themselves, the degree of detail and information required to identify the R&D component of GUF where this type of funding applies. Survey information may be required to provide an accurate estimate of GUF to report in GBARD, which in turn can significantly reduce the timeliness of GBARD data. As noted in Section 12.3 below, such delays should be avoided.

Financial investments supporting R&D

12.29 Governments can provide debt or equity financing for units to carry out R&D activities. This type of support entails the exchange of money for financial assets in the form of claims on future, potentially uncertain cash-flows. Governments may also underwrite some of the risk incurred by third parties providing the financing, and may or may not ask for a fee in full or partial compensation.

12.30 While the guidance in Chapter 4 for performer-based reporting is to treat these financial investments as internal resources for the performer, GBARD statistics have to account for the fact that governments tend to record the budgetary implications of these transactions, depending in particular on whether the accounting principles are resource-based or cash-based. Estimates of grant-equivalent costs, accounting for risk, are often used in the budget to account for the resource requirements, but these can require complicated calculations and significant assumptions that need to be revised over time (see Chapter 13).

12.31 For the purposes of R&D statistics and GBARD statistics in particular, it can be challenging to find a basic reporting principle that is internally consistent, supported by available data sources and sufficiently internationally comparable.

In the case of a loan for R&D, and given the risk, the government may not be able to, or wish to, claim back the full amount. When there is an expectation that this might happen, the implementation of the net approach calls for capturing the expected value of the transfer. When this element is economically significant and it is accounted for in the budget, it should be included in GBARD as incurred. Loans and other potentially repayable advances should be covered in GBARD only on an expected net basis, on the basis of the transfer component.

12.32 Debt forgiveness is recorded in government statistics as a capital transfer received by the debtor from the creditor at the time specified in the agreement that the debt forgiveness takes effect. In the case of R&D-related loans, these should be recorded separately from GBARD, as the *ex-post* forgiveness transfer does not represent actual funding of R&D. Similarly, repayments should not be counted as negative budgetary funds.

12.33 Equity investments for R&D projects, including the provision of equity for new joint ventures with industry, should not be counted within GBARD in application of the expected net principle that government receives in return a financial asset in the form of ownership right over future profits. For practical purposes, countries may wish to report the value of such equity and loan investments separately.

Guarantees for R&D loans

12.34 For practical reasons, loan guarantees are unlikely to be counted because it may not be possible to identify the R&D component of the investment guaranteed by government. In the case of loan guarantees directly attributable to the financing of R&D projects, most governments are likely to record the contingent liabilities outside the balance sheet and to differ in their accounting of their budgetary costs, potentially making provisions for the exposure. Whenever significant, the resource provision for a loan guarantee or other contingent funding, net of fees paid by the parties to the loan, should count as direct funding and included in GBARD, provided that the budget process recognises this as expenditure. As per earlier guidance on forgiveness, in the cases that the government had to release the funds to cover the guarantee, this payment should not be counted as GBARD.

Tax relief for R&D expenditures

12.35 Many governments allow a more advantageous tax treatment of R&D incurred by business enterprises and, in some cases, other units. Current or future tax revenues may be forgone and, in some circumstances, money gets directly transferred from government to these units when their tax liability is insufficient to offset the entitlement for relief. The provision of tax relief for R&D expenses incurred by enterprises is a form of R&D subsidy that is implemented through the tax system and intended to reduce the economic cost of R&D investments (see Chapter 13 for a thorough description of such R&D tax relief possibilities).

12.36 The cost of providing tax relief for R&D expenditures may be part of the budget or feature within budget sections describing non-discretionary expenditures and adjustments to revenues, but this is not always the case. Some governments may have a dedicated amount in the budget for this activity, with actual payments being adjusted *ex post* to fit within the available budget, or they may provide tax relief to all units that demonstrate their eligibility, working on an on-demand basis. For the purposes of this manual, and as explained in Chapter 13, tax revenues forgone by government and amounts actually paid to firms are both considered to be tax subsidies. That information may not always be available in budget documents.

12.37 Due to these potential gaps, for international reporting purposes it is recommended that GBARD statistics exclude all forms of tax relief, including amounts payable to enterprises. When national authorities deem that this type of support is an integral part of their budget, this should be appropriately itemised so that users do not make the error of adding separately derived estimates of tax relief for R&D, compiled under the guidance provided in Chapter 13, with GBARD estimates that contain some specific forms of budgetary support for tax relief. An illustrative reporting schedule is provided in Table 12.2 below.

Other indirect support

12.38 There are several other mechanisms for governments to support indirectly the performance and funding of R&D in an economy. Because of the lack of proven methodologies to assign a monetary value to this type of support, particularly in an internationally comparable way, these should be excluded from GBARD estimates.

12.3. Sources of budgetary data for GBARD and estimation

12.3.1. Funding and performer-based reporting

12.39 As noted in Section 12.1 and in Chapters 4 and 9, R&D expenditures financed by government can be reported either by the government authorities providing the financial resources (funding) or by the institutional unit actually performing the R&D. In general, and for consistency with total GERD estimates, this manual recommends the second approach. However, in order to meet its stated aim of collecting timely data on funding that can be classified by socioeconomic objective, GBARD data should be collected from the funder rather than the performers.

12.3.2. Sources of budgetary data

12.40 In analysing government expenditure, one can distinguish the day that a budget is voted upon by the legislature, the day that the ministry of finance authorises a department to pay out specified funds, the day that a particular commitment is entered into by the departments, the day that deliveries take place, and finally the day that payment orders are issued and cheques are

paid. Although guidance is suggested below, this manual does not prescribe what spending concepts must be used since these vary across countries. It is most important that whichever concept is used, it is used consistently in the compilation of GBARD totals.

Common patterns

12.41 Although details of the budgetary procedure vary from country to country, seven broad stages can be identified:

1. Forecasts (estimates of funding before beginning of budget discussion).
2. Budget forecasts (preliminary figures as requested by ministries, especially for inter- ministerial discussions).
3. Budget proposals (figures presented to the parliament for the coming year).
4. Initial budget appropriations (figures as voted by the legislature for the coming year, including changes introduced in the parliamentary debate). In this context, an appropriation is defined as the act of setting aside money or other resources for a specific purpose, as authorised by the legislature to be spent on a particular programme or line item.
5. Final budget appropriations (figures as voted by the parliament for the coming year, including additional votes during the year).
6. Obligations (money actually committed during the year).
7. Expenditures, as accrued in the accounts or as effectively paid in cash/money.

12.42 Stages 1-4 describe the government's intentions. The data for budgetary year t should be available as soon as possible towards the end of year $t-1$. It is suggested that the preliminary GBARD data should be based on the first budget agreed between the government and the parliament, or stage 4. Some countries might even base their preliminary figures on stage 3. The reporting of data on intentions may be too broad to support the identification of R&D content and detailed objectives. This may require some form of estimation or the use of explicit assumptions that the growth of R&D budgets will match that of the identifiable budget categories. This can give rise to significant revisions in later years.

12.43 During the budgetary year, supplementary budgets may be voted, including increases, cuts and reallocations of R&D funding. These are reflected in stage 5. Data should be available as soon as possible after the end of the budgetary year. It is suggested that the final GBARD data should be based on the final budget appropriations. Some countries may have to base their final figures on stages 6 or 7. These figures may be available on a cash or accruals basis. The cash basis recognises a transaction when the cash is received or when cash is paid out. The accruals basis recognises a transaction when the activity (decision) generating revenue or consuming resources takes place, regardless of when the associated cash is received or paid. Appropriations may be left unexpended. There can also be an unappropriated balance for the cash reserves that have not

been allocated to any purpose. This manual suggests that the reporting of GBARD not be based on figures in stages 6 or 7.

Appropriations carried forward

12.44 In some countries it is common budgetary practice to carry forward large sums from one year to the next, sometimes including them in sums voted in successive years. Multi-annual projects budgeted in only one year or over several should be allocated to the GBARD of the year(s) in which they are budgeted, not in the years of performance. Multi-annual programmes that are authorised at some stage but budgeted over several years should be allocated to the years in which they are budgeted, not the year of authorisation.

Sources of data on obligations and outlays beyond the budget process

12.45 It is common practice for a number of countries to use extended surveys of government units, including agencies and ministries, to measure not only R&D performance but also funding. Potential reasons for this extended effort include the ability to gather more detailed information than that contained in general budget documents, allowing, for example, the identification of the R&D content of budget items, their nature and other policy-relevant information.

12.46 In addition to the resource implications of additional data collection, there can be a substantial loss in timeliness when requiring the adoption of measures to avoid the potential double counting of funds. This applies when resources flow from ministries to intermediary agencies which transfer funds in turn to other agencies and/or performers. From an international perspective, there is a significant risk that the variable adoption of more in-depth inquiries to complete budgetary data may result in difficult-to-compare data, in particular between countries that capture only R&D reflected in high-level budgetary items, versus countries that undertake a more exhaustive search of expenditure items within budgetary items.

12.47 As noted in Chapter 8, the use of such surveys when providing a more complete and accurate representation is not discouraged, although the diversity of practice in countries precludes guidelines in this manual. If this practice is used, it should be well documented, and not interfere with the purposes of presenting timely and internationally comparable GBARD data.

12.48 A number of GBARD components may not be available on a sufficiently timely basis to meet the standard required for preliminary figures (e.g. publication of estimates for year t in year $t-1$). For example:

- Estimates at the subnational level of government may not be readily available. Additional efforts are required for data at the level of regional (state) or possibly local (municipal) government budgets, delaying the full final compilation.
- Incorporating GUF (see Chapters 4 and 9) into GBARD may require estimates derived from survey-based data in the Higher education sector.

- Applying up-to-date coefficients to general budget items may require agency-level data on how funds have been actually used.

12.49 In general, and in the interest of timeliness, it is recommended that when no alternatives are available, preliminary estimates may, for example, result from extrapolating the level of GBARD from its last available estimate using the known rate of growth of a significant component, e.g. the growth rate of central/federal budgets for R&D. This practice should be validated by continued re-assessment of how well the leading indicator has tracked the growth rate of the GBARD series. Users of statistics should be prepared to deal with potential data revisions, as is common in other statistical domains. Although this is not required, it can be helpful and highly policy-relevant for preliminary, forward-looking estimates to include a breakdown of GBARD by socioeconomic objective.

12.4. Distribution by socioeconomic objectives

Criteria for distribution

Purpose or content

12.50 It is possible to distribute GBARD according to the general knowledge content of the R&D programme or project, according to the purpose (i.e. objective) of the R&D programme or project, using a suitable classification of socioeconomic objectives (SEO). However, it is not necessarily easy to identify the content of the R&D and then correctly interpret how it relates to the purpose of the project. The difference between the various concepts can be illustrated by the following example:

- A research project to develop fuel cells to provide power in remote, hostile locations for the military, which is entirely financed by the Ministry of Defence: the R&D content may draw upon engineering and technology domains and is related to “energy” generation objectives, but the primary objective is “defence”.

12.51 In the case of GBARD, the primary objective is more fundamental from the viewpoint of documenting government policy objectives for R&D. It is also the case that information on the primary objective is least likely to be secured from the performers, making a case for the adoption of this criterion based on budgetary data. Therefore, it is recommended that the primary objective approach is used, in principle, for the collection and distribution of budget data.

12.52 Though some government-supported R&D programmes have only one objective, others may have several that feed into each other or that are pursued in parallel. For example, a government may commit money to an aircraft project primarily for military reasons but also to encourage export sales by the aerospace industry and even to assist spin-offs to civil aviation. Multiple objectives can be recorded in a country’s information system. However, in reporting to international organisations, R&D should be classified according to its primary objective.

Identifying primary objectives

12.53 The allocation of R&D budgets to socioeconomic objectives should be at the level that most accurately reflects the funder's objective(s). The actual reporting level chosen will depend on practical possibilities. The whole appropriation may be to an R&D performing or R&D funding unit. In some cases, information on the programme or project level may be obtained.

The distribution of GBARD

12.54 The recommended distribution list is given in Table 12.1 and explained below. It is based on the European Union classification adopted by Eurostat for the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets (NABS) at the one-digit level. The NABS nomenclature was originally established in 1969 and most recently revised in 2007 (Eurostat, 2008). While not all countries use the NABS, the correspondence between the NABS list and this manual's should be used for reporting to the OECD, even if countries use their own classifications for the purposes of producing their national GBARD or equivalent compilations.

12.55 In principle, subject to information being available, all budget items can be assigned to a secondary socioeconomic objective in order to provide a more complete picture. Such an approach can provide a useful source of information for conducting sensitivity analysis and cross-country and longitudinal comparisons for specific objectives. A potential risk of reporting secondary objectives is that comparisons between funds allocated to objectives may fail to duly account for this multiplicity.

Description of socioeconomic objectives (SEO)

1. Exploration and exploitation of the Earth

12.56 This SEO covers funds for R&D with objectives related to the exploration of the Earth's crust and mantle, seas, oceans and atmosphere, as well as for R&D on their exploitation. It also includes climatic and meteorological research, polar exploration and hydrology. It does not include R&D related to soil improvement (SEO 4), land use or fishing (SEO 8), or pollution (SEO 2).

2. Environment

12.57 This SEO covers R&D aimed at improving the control of pollution, including the identification and analysis of the sources of pollution and their causes, and all pollutants, including their dispersal in the environment and the effects on humans, species (fauna, flora, micro-organisms) and the biosphere. The development of monitoring facilities for the measurement of all kinds of pollution is included, as is R&D for the elimination and prevention of all forms of pollution in all types of environment.

Table 12.1. **Classification of socioeconomic objectives for GBARD**

Based on NABS 2007

Chapter number	NABS categories for socioeconomic objectives of R&D	Recommended subcategories
1	Exploration and exploitation of the earth	
2	Environment	
3	Exploration and exploitation of space	
4	Transport, telecommunication and other infrastructures	
5	Energy	
6	Industrial production and technology	
7	Health	
8	Agriculture	
9	Education	
10	Culture, recreation, religion and mass media	
11	Political and social systems, structures and processes	
12	General advancement of knowledge: R&D financed from general university funds (GUF)	12.1 R&D related to Natural Sciences 12.2 R&D related to Engineering Sciences 12.3 R&D related to Medical Sciences 12.4 R&D related to Agricultural Sciences 12.5 R&D related to Social Sciences 12.6 R&D related to Humanities ¹
13	General advancement of knowledge: R&D financed from other sources than GUF	13.1 R&D related to Natural Sciences 13.2 R&D related to Engineering Sciences 13.3 R&D related to Medical Sciences 13.4 R&D related to Agricultural Sciences 13.5 R&D related to Social Sciences 13.6 R&D related to Humanities ¹
14	Defence	

Note: Recommended classification subject to potential revision and update.

1. The Arts are to be included.

Source: Eurostat. Accessed from <http://oe.cd/seo>.

3. Exploration and exploitation of space

12.58 This SEO covers all civil space R&D relating to the scientific exploration of space, space laboratories, space travel and launch systems. Corresponding R&D in defence is classified in SEO 13. Although civil space R&D is not in general concerned with particular objectives, it frequently has a specific goal, such as the advancement of knowledge (e.g. astronomy) or relates to particular applications (e.g. telecommunications satellites or earth observation). The category is nonetheless maintained to facilitate reporting by countries with major space programmes. This chapter does not include corresponding R&D for defence purposes.

4. Transport, telecommunication and other infrastructures

12.59 This SEO covers R&D aimed at infrastructure and land development, including the construction of buildings. More generally, this SEO covers all R&D relating to the general planning of land use. This includes R&D into protection against harmful effects in town and country planning but not research into other types of pollution (SEO 2). This SEO also includes R&D related to transport systems; telecommunication systems; general planning of land use; the construction and planning of buildings; civil engineering; and water supply.

5. Energy

12.60 This SEO covers R&D aimed at improving the production, storage, transportation, distribution and rational use of all forms of energy. It also includes R&D on processes designed to increase the efficiency of energy production and distribution, and the study of energy conservation. It does not include R&D related to prospecting (SEO 1) or R&D into vehicle and engine propulsion (SEO 6). See also Box 12.1 for further clarification on the composition of “energy R&D” as defined by this manual.

Box 12.1. Differences between energy GBARD and IEA RD&D data

The series of data collected and issued by the OECD Directorate for Science, Technology and Innovation, as well as by other international and national organisations for GBARD on this objective, which compile them under the guidelines in this manual, should not be confused with the special series collected and issued by the International Energy Agency (IEA) of the OECD, which covers energy research, development and demonstration expenditures, or “RD&D”, a somewhat broader concept.

The IEA concept of Energy RD&D differs from the Frascati concept of R&D, in that: (i) it focuses on energy-related programmes; (ii) it includes all kinds of “demonstration projects”; and (iii) it includes state-owned companies. The IEA has decided to include demonstration projects when collecting R&D budget data because quite often this is an important part of the development of new technologies. The project’s outcome may be uncertain, and there is an element of risk that is often too large for the private sector to assume alone (IEA, 2011).

Demonstration is defined by the IEA as the design, construction and operation of a prototype of a technology at or near commercial scale with the purpose of providing technical, economic and environmental information to industrialists, financiers, regulators and policy makers. Information on funding for demonstration is collected alongside R&D and separately itemised.

The subject matter scope of IEA’s RD&D data is also broader than SEO 5, because it comprises all programmes that focus on: (i) sourcing energy; (ii) transporting energy; (iii) using energy; and (iv) enhancing energy efficiency.

Box 12.1. Differences between energy GBARD and IEA RD&D data
(cont.)

This includes all RD&D programmes that concern one of the following seven main branches of energy-related developments, as collected by the IEA, which are: (i) energy efficiency; (ii) fossil fuels (oil, gas and coal); (iii) renewables; (iv) nuclear fission and fusion; (v) hydrogen and fuel cells; (vi) other power and storage techniques; and (vii) other cross-cutting technologies or research.

Source: International Energy Agency (2011). Accessed from www.iea.org/stats/RDD%20Manual.pdf.

6. Industrial production and technology

12.61 This SEO covers R&D aimed at the improvement of industrial production and technology, including R&D on industrial products and their manufacturing processes, except where they form an integral part of the pursuit of other objectives (e.g. defence, space, energy, agriculture).

7. Health

12.62 This SEO covers R&D aimed at protecting, promoting and restoring human health broadly interpreted to include health aspects of nutrition and food hygiene. It ranges from preventive medicine, including all aspects of medical and surgical treatment, both for individuals and groups, and the provision of hospital and home care, to social medicine and paediatric and geriatric research.

8. Agriculture

12.63 This SEO covers all R&D aimed at the promotion of agriculture, forestry, fisheries and foodstuff production, or furthering knowledge on chemical fertilisers, biocides, biological pest control and the mechanisation of agriculture, as well as concerning the impact of agricultural and forestry activities on the environment. This also covers R&D aimed at improving food productivity and technology. It does not include R&D on the reduction of pollution (SEO 2); on the development of rural areas; on the construction and planning of buildings; on the improvement of rural rest and recreation amenities and agricultural water supply (SEO 4); on energy measures (SEO 5); or on the food industry (SEO 8).

9. Education

12.64 This SEO includes R&D aimed at supporting general or special education, including training, pedagogy, didactics, and targeted methods for specially gifted persons or those with learning disabilities. This objective applies to all levels of education, from pre- and primary school through to tertiary education, as well as to subsidiary services to education.

10. Culture, recreation, religion and mass media

12.65 This SEO includes R&D aimed at improving the understanding of social phenomena related to cultural activities, religion and leisure activities so as to define their impact on life in society, as well as to racial and cultural integration and on socio-cultural changes in these areas. The concept of “culture” covers the sociology of science, religion, art, sport and leisure, and also comprises inter alia R&D on the media, the mastery of language and social integration, libraries, archives and external cultural policy.

12.66 This SEO also includes R&D related to: recreational and sporting services; cultural services; broadcasting and publishing services; and religious and other community services.

11. Political and social systems, structures and processes

12.67 This SEO includes R&D aimed at improving the understanding of and supporting the political structure of society; public administration issues and economic policy; regional studies and multi-level governance; social change, social processes and social conflicts; the development of social security and social assistance systems; and the social aspects of the organisation of work. This objective also includes R&D related to gender-related social studies, including discrimination and familiar problems; the development of methods of combating poverty at local, national and international level; the protection of specific population categories on the social level (immigrants, delinquents, “drop outs”, etc.), on the sociological level, i.e. with regard to their way of life (young people, adults, retired people, disabled people, etc.) and on the economic level (consumers, farmers, fishermen, miners, the unemployed, etc.); and methods of providing social assistance when sudden changes (natural, technological or social) occur in society.

12.68 This SEO does not include R&D related to industrial health, the health control of communities from the organisational and socio-medical point of view, pollution at the place of work, the prevention of industrial accidents and the medical aspects of the causes of industrial accidents (SEO 7).

12. General advancement of knowledge: R&D financed from general university funds

12.69 When reporting GBARD by “purpose”, this SEO should include, by convention, all R&D financed from general purpose grants from ministries of education, although in some countries many of these programmes may be relevant to other objectives. This convention has been adopted because of the problem of obtaining suitable data and thus of comparability. In order to prevent this category from becoming a large, uninformative item, a supplementary breakdown by top level fields of research and development (FORD) is recommended.

13. General advancement of knowledge: R&D financed from sources other than GUF

12.70 This SEO covers all those budget allocations that are earmarked for R&D but which cannot be attributed to an objective and are financed by sources other than GUF. A supplementary breakdown by top level FORD is also recommended in this case.

14. Defence

12.71 This SEO covers R&D for military purposes. It may also include basic research and nuclear and space research when financed by ministries of defence. Civil research financed by ministries of defence, for example in the fields of meteorology, telecommunications and health, should be classified in the relevant SEOs.

12.5. Other distributions of GBARD

Classification of Functions of Government

12.72 The Classification of Functions of Government (COFOG) has been introduced in Chapter 8. COFOG provides a classification of government outlays by functions (see the online annexe to this manual available at <http://oe.cd/frascati> for COFOG categories). The level one headings have significant similarities with the NABS classification used for R&D. The use of the COFOG classification for GBARD estimates has not been recommended because the categories are not optimised for the purpose of describing R&D expenditures nor aligned with the definitions of R&D in this manual, and its implementation worldwide is still fairly limited. A tentative correspondence table for GBARD may be useful in the near future. Whenever possible, it is recommended that statistical agencies document the differences observed between government expenditure estimates based on the COFOG and those from GBARD estimates so that users can be appropriately informed.

Modes of R&D funding

12.73 Other breakdowns of GBARD and its predecessor have been proposed in recent years in response to policy interests in understanding the nature of government direct support for R&D. For example:

- GBARD by destination of funds, by institutional sector, including the Rest of the world for which no information can be collected by national surveys of domestic R&D performers.
- GBARD by mode of funding, depending on whether the funding is allocated on a project, programmatic or institutional basis. A number of users are also interested in the breakdown of government funding according to the use of competitive criteria (which may apply at both the project and institutional levels).

- GBARD by type of policy instrument, such as procurement contracts and grants in addition to funding of intramural R&D.
- GBARD by level and type of government organisation.
- Furthermore, the European Commission collects data on “National public funding to transnationally coordinated R&D”, including:
 - ❖ national contributions to transnational public R&D performers
 - ❖ national contributions to Europe-wide transnational public R&D programmes
 - ❖ national contributions to bilateral or multilateral public R&D programmes established between EU Member State governments.

12.74 The experience of recent experimental data collections has indicated that a limited number of countries are currently in a position to provide a majority of these indicators on the basis of budget data. This means that further detailed information has to be collected from ministries, agencies and administrative records. Notwithstanding its potential usefulness, the manual cannot therefore recommend pursuing the collection of such information through the GBARD framework. Countries with an interest in this type of data may see their needs best served by using surveys of government entities, extending the scope of these beyond known R&D performers in the government sector, as discussed in Chapter 8.

12.6. The use of GBARD data

12.75 The production of GBARD data should be aimed principally at pursuing its two main objectives: providing timely information on governmental R&D budgets, and providing a consistent picture of how this funding is distributed, based on the socioeconomic objective.

Main differences between GBARD and GERD data

12.76 Users of the GBARD often discover and have difficulty in understanding differences between the sums reported as total GBARD (funder-based approach) and government-financed GERD (performer-based approach). The variations in the sums reported spring from differences in the specifications of the data.

General differences

12.77 Although in principle both series should be established on the basis of the same definition and scope of R&D, covering R&D in all fields of knowledge and comprising both current and capital expenditures, they differ in a number of respects.

- Government-financed GERD and GERD objectives data are based on reports by R&D performers, whereas GBARD is based on reports by funders and is based principally on budgetary data. Performers may have a different and more

accurate idea of the R&D content of the project or activities concerned, but may also understate the full extent of government support.

- The performer's appreciation of the objectives of the project concerned may differ significantly from that of the funder, notably for R&D funded from block grants such as GUF, which should be distributed by objective in the GERD approach for countries that report such a distribution.
- It is also possible for the measure of GUF to differ between that derived from R&D performance estimates (within HERD) and that provided from within GBARD. Consider the following example: a central government may provide universities with a block grant worth 100 currency units, out of which 30 is allocated on the basis of scientific and R&D excellence-related criteria, while the rest is determined on the basis of student numbers and teaching costs. Upon receipt of such block grants, universities may be free to allocate the total 100 across research, teaching or other legitimate purposes. One year they may ultimately choose to dedicate 40 to R&D, another year 20. The GBARD measure of GUF may in some cases be reported as 30, while the HERD-based measure of GUF would be 40 (or 20). The GBARD measure of GUF should in no case be reported as 100, as this would clearly overstate the amount of budget support intended and provided for R&D.
- Budget-based measures are also likely to include a component of funding for profits and overheads that are excluded from the measure of R&D performance.
- GERD-based series cover only R&D performed by resident units, whereas GBARD also includes payments to foreign performers, including international organisations. Differences may also occur because of difference in the reference periods applied (calendar or fiscal years), or because appropriations may never be realised, or because there is a difference in the time when appropriations are made and when R&D is performed.
- Estimates of government-financed GERD should include R&D financed by central (federal), regional (state) and local (municipal) government, whereas GBARD excludes local (municipal) government, and not all countries report, or can report, data at the regional (state) level.

GBARD reporting and indicators

12.78 Table 12.2 presents an indicative template for the reporting of GBARD data. The template highlights the importance of timeliness for total GBARD and foresees the possibility of using estimates based on the relevant budget categories. The possibility that the availability of delayed GUF figures may impact on timeliness points to the advanced reporting of GBARD excluding GUF, which may be used as an indicator for overall GBARD growth.

Table 12.2. **Indicative reporting template for GBARD**

Main categories	Subdivision	Year				
		t-3	t-2	t-1	t	t+1
Total GBARD		✓	✓	✓	✓p	✓e
GBARD-excluding GUF		✓	✓	✓	✓p	✓e
	SE01	✓	✓	✓	✓p/e	
	SE02	✓	✓	✓	✓p/e	
	..	✓	✓	✓	✓p/e	
	SE011	✓	✓	✓	✓p/e	
	SE013	✓	✓	✓	✓p/e	
	Total	✓	✓	✓	✓p/e	
	Breakdown by top level FORD					
	SE014	✓	✓	✓	✓p/e	
GUF GBARD	SE012	✓	✓	✓	✓p/e	
	Total	✓	✓	✓	✓p/e	
	Breakdown by top level FORD					
Optional breakdowns and relevant memo items						
Capital	Capital R&D funds	✓	✓	✓	✓	✓
	R&D depreciation funds					
Level of government	Central/federal government					
	Regional/state government					
Budget funds allocated through tax relief	Not separated from GBARD total	✓	✓	✓	✓	
	Separated from GBARD total					
Modes of funding						

Note: p = preliminary; e = estimate, ✓ Indicates priority information.

12.79 The schema also points to the breakdown of SEO12 and SEO13 by fields of R&D, the itemisation of capital-related components, the level of government, as well as the potential tax relief included in GBARD estimates or excluded but reported in budgets. The latter should allow a better integration of the budget data and avoid double counting with estimates of tax relief for R&D as compiled following the guidelines in Chapter 13 and a more complete representation of government financial support for R&D.

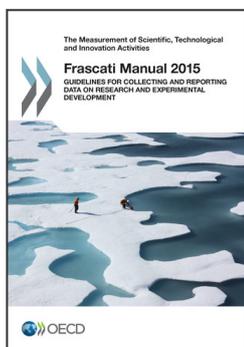
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