

Chapter 8

Government R&D

This chapter provides guidance on the measurement of financial and human resources for research and experimental development (R&D) performed in the Government sector. It also deals with the Government sector as a funder of R&D and links to work in Chapter 12 on government budget allocations for R&D (GBARD) and Chapter 13 on government tax relief for R&D (GTARD). The chapter draws upon the System of National Accounts (SNA) for the description of the Government sector which not only includes governments, but non-profit institutions controlled by government. It describes approaches for measuring government intramural R&D expenditure (GOVERD), the functional distribution of R&D by types of costs follows the recommendations in Chapter 4, but raises specific cases for attention. Distribution of GOVERD by source of funds, by type of R&D, field of R&D, technology area, socioeconomic objectives, functions of government and geographic location are discussed. Guidance is provided on the measurement of R&D personnel in the Government sector. Finally there is an overview of issues arising in the measurement of government funding of R&D from the perspective of the funder.

8.1. Introduction

8.1 Interest in measuring the role of the Government sector in R&D has been a constant feature of this manual since its first edition in 1963. Governments play a significant role both as performers and funders of R&D activities, both domestically and in the Rest of the world. This chapter focuses primarily on the measurement of R&D performance and personnel within the Government sector, in line with this manual's recommended approach to measuring the resources dedicated to R&D. However, it also attempts to provide a nexus between the recommended performer-based approach and the complementary funder-based approach to measuring government's role as a *funder* of R&D throughout the entire economy. As countries have evolved in their use of R&D policy instruments over time, national statistical offices that compile R&D data have had to consider how best to reflect such practices within this statistical framework. This chapter provides basic guidance on this, in addition to drawing links with Chapters 12 and 13, which are respectively dedicated to the measurement of government budget allocations for R&D (GBARD) and government tax relief for R&D (GTARD).

8.2. The scope of the Government sector for R&D measurement purposes

Definition and scope of the Government sector

8.2 For broad statistical purposes, the System of National Accounts (SNA) notes that the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes, to redistribute income and wealth by means of transfers, and to engage in non-market production.

8.3 As defined in the SNA (EC et al., 2009: para. 4.117) and reflected in this manual (Chapter 3, Section 3.4), government units are unique kinds of legal entities established by political processes that have legislative, judicial or executive authority over other institutional units within a given area. Consistent with the SNA, however, the Government sector is a broader entity that comprises not only these "core" government units, but also the non-profit institutions (NPIs) it controls. As explained in Chapter 3, the definition of the Government sector used in this manual – and in reporting R&D statistics – differs from that of the SNA ("General government"), because the former does not include higher education institutions that meet the SNA attributes of government institutions. With that sole exception, the definitions are intended to fully match.

8.4 Consistent with the SNA, government-controlled enterprises (termed “public enterprises” or interchangeably, “public business enterprises” in this manual) are excluded from the Government sector; rather, public enterprises are included in the Business enterprise sector (see Chapter 7 and the guidance below on the boundary between units that are part of the Government and Business enterprise sectors).

8.5 The Government sector thus comprises all units of central (federal), regional (state) and municipal (local) government, including social security funds, except those units that fit the description of higher education institutions provided in Chapter 3 and further described in Chapter 9, as well as all non-market non-profit institutions that are controlled by government units, and that are not themselves part of the Higher education sector.

8.6 **Central (or federal) government** is generally composed of a central group of departments or ministries that make up a single institutional unit – this unit is often referred to as the national government and the unit covered by the main budget account – plus, in many countries, other institutional units. The departments may be responsible for considerable amounts of R&D expenditure (for intramural or extramural R&D) within the framework of the government’s overall budget, but often they are not separate institutional units capable of owning assets, incurring liabilities, engaging in transactions, etc., independently of central government as a whole. Their revenues as well as expenses and expenditures are normally regulated and controlled by a Ministry of Finance or its functional equivalent by means of a general budget approved by the legislature.

8.7 In addition to government departments and ministries, the Government sector also comprises **other government bodies** such as **agencies** that have a separate legal identity and substantial autonomy, including discretion over the volume and composition of their expenses and outlays, and that also possibly have direct sources of revenue. These are separate government units and are often referred to as **extra-budgetary units** because they have separate budgets, and any transfers from the main budget account are supplemented by their own sources of revenue, such as earmarked taxes or fees for services. They may have been established to carry out specific functions, including possibly R&D funding, R&D performance or both. In some countries, these specialised agencies, centres and institutes may account for a large proportion of R&D performance within government and possibly the whole economy. These institutions are also part of the Government sector.

8.8 Included in “other government bodies” are **non-profit institutions (NPIs)** that are non-market producers and are controlled by a government unit, regardless of whether their legal status describes them as established independently of government. A number of R&D-performing institutions such as research centres, museums, etc., may fit under this category. As recognised in Chapter 3, economic control over these entities can be difficult to establish;

it entails considerable nuances that may result in international differences in practical implementation. In many cases, governments may be able to exert control by means of funding decisions, but this should not be the sole criterion used in establishing whether such an institution is effectively controlled by government. It is possible for an NPI to be majority-funded by government, but the latter may not have the power to direct its research activities.

8.9 The **regional (or state) government** subsector consists of regional or state governments that are separate institutional units, in addition to agencies and non-market NPIs that are controlled by regional (state) governments. This subsector exercises some of the functions of government at a level below that of central/federal government and above that of the governmental institutional units existing at a local level. They are institutional units whose fiscal, legislative and executive authority extends only over the individual “states” into which the country as a whole may be divided. Such “states” may be described by different terms in different countries, i.e. by reference to terms such as “regions” or “provinces”.

8.10 The **local (or municipal) government** subsector consists of local (or municipal) governments that are separate institutional units, in addition to agencies and non-market NPIs that are controlled by local governments. In principle, local (or municipal) government units are institutional units whose fiscal, legislative and executive authority extends over the smallest geographical areas distinguished for administrative and political purposes. The scope of their authority is generally much less than that of central (or federal) government or regional (or state) governments.

Identification and boundaries of Government sector units

8.11 Units in the Government sector can be involved in a range of different economic activities, including public administration, health and social work, defence, education (except those in the Higher education sector), as well as several other public services, which may include institutions such as public museums, archives, historical sites, botanical and zoological gardens, natural reserves, or even institutions specialised in providing research and development services for use by government itself or other sectors.

8.12 Three main attributes help identify whether any given unit should be classified into the Government sector: whether it sells its output at economically significant prices, whether government units control the institution, and whether it is appropriate to consider this unit as part of the Higher education sector, given the special rules that apply in this manual for identifying that sector. The implementation of these criteria is summarised in Table 8.1.

8.13 Core government units can adopt a wide range of legal designations whose terminology and application vary across jurisdictions. This may include ministries or departments with ministerial-like oversight, agencies, non-departmental public bodies and institutions with special charters. These terms are provided for illustrative purposes.

Table 8.1. The components and boundaries of the Government sector in the Frascati Manual

[The components of the Government sector identified in **bold**]

Level of government	The public sector			
	Government units	Institutions controlled by government units		
		Non-market non-profit institutions (NPIs)		Market producers
		Not in higher education	Higher education	
Central/federal	Ministries, departments, agencies...	Non-market NPIs¹ controlled by government (e.g. some research institutes, centres, museums...)	Non-market higher education institutions (HEIs) ² controlled by government	Public business enterprises (including NPIs serving them) and public HEIs that are market producers ³
Regional/state	Regional/state departments, ministries, agencies...			
Municipal/local	Local authorities, ...			
Observations on classification	Core government units, at various jurisdictional levels, primarily dedicated to public administration activities, in the executive, legislative and judiciary. Can also comprise extra-budgetary units.	Part of FM Government sector and SNA General government, and therefore part of public sector	Not part of FM Government sector, but part of public sector and SNA General Government. Part of FM Higher education sector.	Not part of FM Government sector or SNA General Government sector. Part of FM Business enterprise sector or Higher education sector and also part of public sector

Notes: FM = Frascati Manual; NPISH = Non-profit institutions serving households; SNA = System of National Accounts.

1. This group does not contain all non-market NPIs, only those controlled by government. Its counterpart outside the public sector comprises all private non-profit institutions including NPISHs and market NPIs classified in the Business Enterprise sector (SNA corporations sector).

2. This group does not contain all higher education institutions, only those controlled by government. Its counterpart outside the public sector comprises all private non-market higher education institutions.

3. The counterpart to these market producers outside the public sector comprises all private business enterprises as well as private market-based higher education institutions.

The boundary between units in the Government and in the Private non-profit sectors

8.14 Control is the key criterion in determining whether an NPI is clearly self-governing or is part of the government's administrative system. Establishing whether a given institute, museum, research centre, etc., is controlled by government can be challenging, especially if it is not possible to draw on authoritative classifications embedded in statistical registers. With the exception of overlaps with Higher education, which is not separately identified as an institutional sector in the SNA, the SNA classifications are *a fortiori* appropriate criteria for allocating units to the Government sector. Broad guidance on how to apply the control criteria is provided in Chapter 3 and Chapter 10.

8.15 In general, the predominance of government funding over other sources is not sufficient for defining control by government, but it can be a major factor to take into consideration, in combination with other information about the nature of such funding (e.g. competitively awarded or not, board membership, golden shares, etc.) when deciding whether government has decision-making authority (i.e. control) for the R&D performing unit (see Box 8.1).

Box 8.1. Government control of non-profit institutions (NPIs)

Control of an NPI is defined as the ability to determine the general policy or programme of the NPI. To determine whether an NPI is controlled by the government, the following five indicators of control are typically used:

1. the ability to dictate the appointment of officers or management boards
2. the ability to dictate other provisions, allowing the government to determine significant aspects of the general policy or programme of the NPI, such as the right to remove key personnel or veto proposed appointments, require prior approval of budgets or financial arrangements by the government, or prevent the NPI from changing its constitution or dissolving itself
3. the presence of contractual agreements, giving rights to impose conditions such as those cited above
4. the degree and type of financing by government, to the extent that this may prevent the NPI from determining its own policy or programme
5. the existence of risk exposure, if a government openly allows itself to be exposed to all, or a large proportion of, the financial risks associated with an NPI's activities.

Source: IMF (2014), Government Finance Statistics Manual. www.imf.org/external/np/sta/gfsm.

8.16 National academies of science exist within several countries, and they may exhibit different roles and responsibilities. In some cases, they may encompass scientific research institutes, but in many other cases their role can be related more to the dissemination of knowledge and the general promotion of scientific research. The status of these organisations can change over time, especially in transition economies where they may change from being part of the Government sector to becoming part of the Private non-profit sector or possibly the Business enterprise sector, which encompasses both public and private business enterprises.

The boundary between units in the Government and in the Business enterprise sectors

8.17 As noted earlier and in Table 8.1, it is important not to confuse the concept of “Government sector” with that of “public sector”. Indicators for the total public sector can be produced by aggregating the Government sector

and the government-controlled components of the Business enterprise and Higher education sectors. Corporations and other types of business enterprises that are controlled by governments fall outside the scope of the definition of the Government sector. As indicated in Chapters 3 and 7 and in line with standard SNA guidance, the dividing line between these public [business] enterprises and units in the Government sector is that the former primarily aim to sell most of their output at economically significant prices (see Glossary), including a profit margin for their activities.

8.18 There may be R&D-performing institutions like research centres, museums or academies of science that generate some significant commercial revenue, for example, from the licensing of intellectual property arising from past R&D or by providing research and consultancy services on market terms. Whenever possible, it is important that classification decisions are not driven by unusual circumstances, perhaps one-time occurrence such as, for example, when extraordinary commercial revenues are realised as a result of the disposal of an asset.

The boundary between units in the Government and in the Higher education sectors

8.19 There are a number of challenges in differentiating Government from Higher education sector activities. Chapter 3 and Chapter 9 deal with these boundary issues in some detail. There can be extensive personnel and institutional overlaps and linkages between higher education institutions as defined in this manual and units within the General government sector, as defined by the SNA.

8.20 In many countries, government units may have the ability to direct and control the activities of several if not all higher education institutions. This form of control does not make higher education institutions part of the Government sector as defined in this manual, but still qualifies them as part of the public sector.

8.21 Government units may be staffed by research personnel with affiliations to other institutions, in particular higher education institutions. At times it can be difficult to differentiate their government-related activities from those for their higher education employers. The double affiliation of individuals to a higher education institution should not drive the reclassification of the government unit unless there are other institutional control mechanisms that warrant the classification of the government unit as a higher education institution.

8.22 One area of potential difficulty is the treatment of government hospitals and related health institutions with some type of formal connection to higher education institutions, where the formal provision of tertiary education programmes and other major control linkages criteria would guide the classification of such government institutions to the Higher education sector.

However, it is possible for a university hospital (described as such on the basis of its history and connections to a higher education institution, e.g. allowing it to support/host the training of medical students) to be classified under the Government sector. This will be the case if the hospital happens to be controlled and principally funded by government authorities, operates on a non-profit basis, and has sufficient independence from the higher education institution with respect to the R&D activities it engages in.

Other special cases

8.23 Government units may enter into partnerships with other organisations in government or other sectors to set up entities that are involved in R&D performance. These entities, if they attain the status of institutional units, are subject to the same general classification principles outlined in Chapter 3.

Possible classifications of Government sector units

Classification by main economic activity

8.24 The cross-cutting relevance of this institutional classification for distributing R&D performance (as well as personnel) has been noted in Chapter 3. This also applies to the Government sector in light of the various possible economic activities, especially services, provided by government institutions. It is recommended that all government units including NPIs controlled by government be classified into their main economic activity as identified by the 2-digit Division ISIC Rev4 categories (United Nations, 2008), the detailed classification for which is found online in annex guidance to this manual available at <http://oe.cd/frascati>. If this is not practical, it is minimally recommended to identify those units that are part of ISIC Division 72: Scientific research and development, with a view to identifying government research organisations. It is also recommended that government-controlled hospitals and clinics (which usually are classified in Division 86; Human health activities) be separately identified, for reasons clarified above.

Classification of functions of government

8.25 The Classification of Functions of Government (COFOG) is a generic classification of the functions, or socioeconomic objectives, that general government units aim to achieve through various kinds of expenditure. COFOG was produced by the OECD and published alongside three other classifications (United Nations, 2000). COFOG provides a classification system for government entities and financial outlays by functions of general interest (see the online annex to this manual available at <http://oe.cd/frascati> for COFOG categories). The level-one headings in COFOG have significant similarities with the classifications of socioeconomic objectives used for R&D (see Section 8.4 on Distribution of GOVERD by socioeconomic objective and Chapter 12, Section 12.5). The use of COFOG headings for government institutions in the context of R&D statistics cannot be

recommended by this manual, because the categories are not optimised for the purpose of describing R&D expenditures, although a tentative correspondence table may be useful should COFOG become more widely adopted in mainstream national statistical systems.

8.3. Identification of R&D in the Government sector

8.26 The identification of what is R&D should follow the principles laid down in Chapter 2. The core units in central/federal, regional/state and municipal/local government may themselves perform R&D. Examples may include special research units within ministries of variable size but also larger bodies such as the armed forces.

8.27 Difficulties in separating R&D from other related activities arise when these are undertaken simultaneously within an organisation. Not all government units performing R&D will be fully dedicated to such endeavours, but may often conduct R&D as a means to further the primary objectives of the unit. Government units can be engaged in activities such as health provision, general-purpose data collection for monitoring natural or social systems, or the development of large-scale infrastructures, whose delivery may benefit from internal or external R&D performance. The intellectual and physical assets arising from the core activities of government units may also be used as main inputs for R&D projects that may be carried out within such organisations. Consistency in how these activities are dealt with in the collection of R&D statistics can have important effects on the international comparability of the resulting R&D data.

Related Science & Technology (S&T) activities

8.28 In addition to the pursuit of basic or applied research and experimental development, common R&D-related roles for units in the Government sector include the provision of technology services such as technical testing and standardisation, technology transfer (*e.g.* physical transfer of technology, prototypes and processes and/or “know-how”), the development of new instrumentation, the preservation, storage and access to knowledge and scientific collections through libraries, databases and repositories, and the provision of major scientific infrastructure and facilities (*e.g.* nuclear reactors, satellites, large telescopes, oceanographic vessels *etc.*). These should not be included in R&D.

System development and demonstration

8.29 Occasionally, government units may make major investments in large fixed assets that are considered to be “first of their kind” or to offer previously unavailable capabilities. Because of their potential contribution to innovative activities, they may be inclined to include all such construction costs as R&D. For international comparability, however, only the costs that are specifically identified as capital to be used for R&D should be included

as intramural R&D. Generally, such costs should not be reported as current R&D expenditures, but should be reported as capital R&D expenditures (see Chapter 4).

8.30 Some countries use **technology readiness-level (TRL)** classifications in the description and management of projects in defence, aerospace and other sectors requiring systems engineering. Different TRL models have been developed to help assess the maturity of the technological elements of such programmes, but remain largely untested in other domains. Given the level of government involvement in the areas where TRL models are used, they can be referred to in the description of government intramural R&D as well as in procurement contracts specifying the performance of R&D by a third party. In line with Chapter 2, it is recommended that if such models are used, they should be assessed to determine whether they can contribute in any way to improving the collection of statistics on government R&D performance or government funding of R&D (Section 8.6).

8.31 Because of the multiplicity of TRL classification systems and their generic description, it is not possible to provide a concrete and generally applicable mapping of TRLs – or more specifically, the work conducted in order to bring the programme to a higher readiness level – to the types of R&D (basic, research, applied research and experimental development) as defined in this manual. TRL to R&D mapping may be most difficult in relation to the various stages that involve the demonstration of projects/systems in diverse, more realistic, use environments, resulting in new specification requirements for the projects/systems. Chapter 2 indicates that when a prototype performance is assessed by actual operational usage, this assessment is unlikely to represent R&D. Efforts to address major flaws identified through operations or new requirements may, however, represent R&D as long as the criteria formulated in Chapter 2 are met.

Policy-related studies

8.32 R&D efforts may underpin the decision-making process within government units. While R&D may be outsourced to external organisations, government units may have dedicated teams actively involved in carrying out analyses such as *ex-ante* and *ex-post* appraisals or evaluations. These activities may in some cases meet the criteria for an R&D project. However, this is not always the case, and not all evidence-building efforts associated with policy advice can be accurately described as R&D. It is relevant to consider in some detail what is the expertise of those involved in the activity, how knowledge is codified within the organisation, and how quality standards are assured in terms of the research questions and the methodology applied. There is a significant risk that some types of socio-economic consultancy (internal or external) may be inaccurately reported as R&D.

8.33 The role of scientific advisors within government is an important one. However, the application of established decision criteria to policy making does not represent R&D. Efforts aimed at developing improved methodologies for science-based decision making can be considered R&D.

Health care and R&D in “public” hospitals

8.34 As previously noted, in many countries a substantial fraction of hospitals and other healthcare institutions are controlled by government and do not meet the criteria for classification as part of the Higher education sector. As a result, health-related R&D can be an important component of the R&D performed within government. The combination of healthcare, research and training activities can make it difficult to identify the R&D share of such institutions’ activities. R&D can take place in partnership with higher education institutions, government or private non-profit institutions or business enterprises, for example in the context of clinical trials. Relevant guidance is provided in Chapters 2, 4 and 9.

R&D financing and its administration

8.35 As noted in Chapter 4, the raising, management and distribution of funds for R&D grants to performers by ministries, research or funding agencies, and other government units should not be included as R&D. In the case of government units that both perform intramural R&D and fund extramural R&D, the administrative cost for preparing and monitoring extramural R&D contracts may be counted as part of intramural R&D expenditure.

8.4. Measuring R&D expenditures and personnel in the Government sector

Government intramural R&D expenditure (GOVERD)

8.36 The main aggregate statistic used to describe R&D performance within the Government sector is GOVERD, Government Expenditure on R&D. GOVERD represents the component of Gross domestic expenditure on R&D (GERD) (see Chapter 4) incurred by units belonging to the Government sector. It is the measure of expenditures on intramural R&D within the Government sector during a specific reference period.

8.37 Government units often host significant components of R&D projects carried out under the responsibility of non-government institutions. For example, a government facility may allow the use of its equipment for testing by a range of business enterprises as part of their R&D projects to develop new products. In such a case, regardless of the fact that some of that performance has occurred on government premises, this may not be sufficient to describe the government unit as an R&D performer. The government is providing a service to the business enterprise, which is the unit performing the R&D. The government unit may nonetheless be an R&D performer if it undertakes its own projects in the facility.

Functional distributions of GOVERD

Distribution of GOVERD by type of costs

8.38 The rules that apply to the distribution of GOVERD by type of costs are detailed in Chapter 4 (Table 4.1). These recommendations include a breakdown between the labour costs of R&D personnel and other current costs (current expenditures) and capital expenditures (by asset type), with separately itemised capital depreciation costs for capital assets owned. Because of the specificity of individual government units within a country, this information should, if possible, be directly requested from respondents and not imputed from other units.

8.39 Within this general guidance, there are some particular cases that deserve particular attention:

- Labour costs include actual or imputed contributions to pension funds and other social security payments for R&D personnel. They need not be visible in the statistical unit's bookkeeping accounts; they may often involve transactions to other parts of the Government sector, such as social security funds. Even when no transactions are involved, an attempt should be made to estimate these costs from the perspective of the reporting unit.
- Value-added tax (VAT) for materials and services may not be reclaimable for units in the Government sector, in which case, it needs to be counted as part of other current costs.

8.40 The quantification of R&D expenditures incurred in the context of facilities used for R&D is potentially one of the most challenging aspects of R&D measurement in the Government sector. The examples discussed in Chapter 4 indicate the need to capture the economic cost of facilities that are used without paying an actual fee, as well as to avoid possible double counting of asset acquisition or construction costs and the costs to the recipients who use the facilities.

8.41 There are examples where the government owns and maintains special facilities that are used by researchers employed by the facility and visitors from other agencies and business enterprises for approved R&D projects. When used by other government or non-government performers, user charges – which might include operation and maintenance (O&M) costs – that are paid to the facilities owner are part of the current costs reported by the R&D performer using the facilities. Such O&M costs that are recovered in user charges should be excluded from reports from the government agency that owns the facilities in order to avoid the double counting of such expenditures. Because the use of the facilities may be infrequent or the charge too small to cover the costs of keeping R&D facilities operational, then an appropriately justified component of O&M costs may be attributed as intramural expenditure, in other current costs, by the government unit that owns the facility.

Distribution of GOVERD by source of funds

8.42 Traditionally, it had been largely assumed that funding from non-government sources was of limited relevance in the case of R&D performance within the Government sector, given the dominant role of internal budgetary sources. However, in current circumstances the absence of such information could be quite misleading. The widespread use of private-public partnerships and mixed arrangements, the search for alternative funding sources within extra-budgetary government units and NPIs controlled by government, and the existence of international agreements between countries and supranational organisations call for a detailed collection of information on the origin of funds used for R&D in government, from both domestic sources and the Rest of the world.

8.43 The sources of funding for government institutions and their R&D activities can be based on earmarked revenues (e.g. when defined as a percentage of total government revenues or when identified with specific taxes or social security contributions), transfers from the budget, general sales of goods and/or services or user charges, sales of financial and nonfinancial assets, borrowing, or general donor funds (IMF, 2014). Extra-budgetary sources refer to general government transactions, often with separate banking and institutional arrangements that are not included in the annual central government-level budget law and the budgets of subnational levels of government.

8.44 The reporting structure presented in Table 8.2 is recommended for the collection of information on the source of funds. The breakdown between exchange and transfer-based funds is more relevant for extra-budgetary government units as well as for NPIs controlled by government, which may rely to a larger extent on non-budgetary sources of funds and are more likely to undertake R&D as a service to other organisations or firms and receive financial compensation in return.

Distribution of GOVERD by type of R&D

8.45 As for all other sectors, it is recommended that data are collected from government units on the breakdown of R&D expenditures by type of R&D, basic research, applied research and experimental development, as defined in Chapter 2.

Distribution of GOVERD by field of R&D

8.46 It is recommended whenever possible to distribute R&D performance within government units by the top level field of research and development (FORD).

Table 8.2. **Source of funds to be collected in government R&D performer surveys**

Source of funds for R&D performed within a government institution	Funds for R&D in exchange ¹	Funds for R&D as a transfer ¹	Total funds for R&D intramural performance
Government sector	x	x	✓
- Own agency/institution (internal funds)	x	x	✓
- Other central or federal	x	x	✓
- Other regional or state or local	x	x	✓
Business enterprise sector	✓	✓	✓
Higher education sector	✓	✓	✓
Private non-profit sector	✓	✓	✓
Rest of the world	✓	✓	✓
- Government sector	✓	✓	✓
- International organisations (including supranational organisations)	✓	✓	✓
- Business enterprise sector	✓	✓	✓
- Higher education sector	✓	✓	✓
- Private non-profit sector	✓	✓	✓
All sources			=GOVERD

Notes: Adapted from Table 4.1 in this manual.

x = not applicable; no need to collect.

1. Breakdown exchange/transfer more relevant for extra-budgetary government units and NPIS controlled by government.

8.47 At least in the case of government institutions classified in ISIC Rev. 4 Division 72, scientific research and development, it can be helpful to classify these according to the main FORD, using its top level headings. The detailed FORD classification can be found online in annex guidance to this manual available at <http://oe.cd/frascati>. Given the existence of multidisciplinary centres in government, it may be useful to indicate a secondary field of research or use an additional, multidisciplinary category.

Distribution of GOVERD by technology area

8.48 Countries may find it useful to report GOVERD by technology area. Biotechnology, Nanotechnology and Information Communication Technologies (ICT) are among the most important.

Distribution of GOVERD by socioeconomic objective

8.49 Performer-based reporting of GOVERD by socioeconomic objective is in principle possible for institutions in the Government sector. This approach should not be confused with the analysis of government budget allocations for R&D (GBARD) by socioeconomic objective (see Chapter 12 for extensive details about such distributions).

8.50 The recommended distribution list is based on the categories in the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets (NABS) (Eurostat, 2008) and other national adaptations with a direct correspondence to it. This list is the same as that suggested for government R&D funding, with the exception of research financed from general university funds, which is not appropriate in this instance. R&D should be distributed by reporting units according to the primary project objectives and aggregating over their research portfolio.

8.51 In the case of the Government sector and following the guidance in Chapter 4, it is particularly important to compile separate totals for defence and civil GOVERD and to document any potential under-coverage of defence-related R&D. This is especially relevant for countries with significant defence R&D programmes, part of which may be carried within government units. Furthermore, information on these defence R&D projects may be highly sensitive and classified in a way that makes R&D expenditures not distinguishable from non-R&D-based programmes. As noted in Chapter 4, it is important to ensure the international comparability at least of data on civil R&D. It is also important that the ancillary metadata on the GOVERD clearly documents the margins of uncertainty concerning unmeasured R&D within government.

Distribution of GOVERD by functions of government

8.52 Some countries may find it useful to distribute GOVERD to COFOG categories (see Section 8.2 on institutional classifications). However, for reasons described previously, the use of COFOG categories in the context of R&D statistics is not recommended by this manual.

Distribution of GOVERD by geographic location

8.53 Countries may find it useful to compile separate totals for the distribution of GOVERD by location/region. The choice of geographic distribution is determined according to national and international needs, with further details found online in annex guidance to this manual available at <http://oe.cd/frascati>.

GOVERD versus government funding of extramural R&D performance

8.54 Section 8.6 will consider in more detail the reporting of funding by government units for extramural R&D. This subsection is principally concerned with the boundaries between intramural R&D and extramurally performed R&D for the Government sector. Among R&D performers in this sector, some of the expenditures may have been incurred for activities carried out off-premises and even possibly abroad, for example in outer space, in Antarctica, in the government institution's diplomatic or consular representations abroad, or on a short-term basis, e.g. as field work, in some other country. When such R&D takes place under the responsibility of the government institution under observation,

this corresponds to its intramural R&D. Payments for services to other parties that contribute to the R&D effort also correspond to its own intramural R&D.

8.55 Costs for consultants that provide R&D in fulfilment of a specific order (acquisition), but not as an integrated part of the government unit's R&D projects, should be treated as funding of extramural R&D by the statistical unit receiving the R&D. The delivering statistical unit, where these consultants are employed, should report this activity as intramural R&D expenditure. The breakdown of expenditures for extramural R&D expenditures should be as indicated in Chapter 4.

8.56 In classifying whether funds provided by one government entity to another government entity should be treated as funds for intramural versus extramural performance, the level of government (i.e. central/federal, regional/state, local/municipal; see Table 8.1) is the institutional unit of interest and provides the determining criterion. For example, R&D funds received by a ministry Y of the central government from another central government ministry X should be reported as ministry Y's internal funds for intramural R&D. For ministry X that provides (is the source of) those R&D funds, they are not to be reported as either part of their internal funds or as funds for extramural performance. At a sector aggregation, these funds are simply internal central government funds for central government's intramural R&D performance. The rationale is that such transactions are among different parts of the same institutional unit of the central government, even if the statistical units are smaller entities such as ministries.

8.57 Attention should be given to avoid the possibility of double counting R&D funds provided by "intermediary" agencies that receive funds from ministries and agencies and then re-allocate and pass through funds to other performing institutions. In the previous example, if the funds provided by ministry X to ministry Y are passed on by the intermediary ministry Y to an R&D performer outside of the Government sector, the government institution is not the performer – i.e. there is no GOVERD), and the funds are reported as government funds for extramural non-government performance, originating from ministry X, if such detail is collected (see Section 8.5 and Table 8.3).

8.58 Transactions across entities within central and regional governments or different extra-budgetary units and other government-controlled NPIs in the Government sector should be reported as extramural funding when these are separate institutions with their own accounts. For example, R&D funds received by agency Z of a regional government from a central government ministry X should be reported as external (government) funds for agency Z's intramural R&D. For central government ministry X that provides (is the source of) those R&D funds, they are to be reported as funds for extramural performance by regional government.

R&D personnel in the Government sector

8.59 The R&D personnel categories to be reported for the Government sector are the same as those of the other R&D performing sectors and are defined in Chapter 5 of this manual. The distributions recommended above for expenditures should be applied whenever possible to R&D personnel.

8.60 Individuals in government institutions solely dedicated to the administration and assessment of R&D funding proposals, e.g. in the context of awarding grants or procurement contracts, should not be considered as R&D personnel. Their activities are not R&D. However, as noted in Chapter 4, government institutions that combine R&D funding and performance roles may include the costs of their personnel working on the substantive, financial or administrative aspects of R&D contracts in “other current costs”; but such personnel should not be classified as R&D personnel.

8.61 Given the likely presence of external R&D personnel in government R&D facilities, it is recommended in line with Chapter 5 to report these individuals in the appropriate category, separately from internal R&D personnel. This also applies to trainees such as doctoral and master’s students, if they are actually performing R&D under the criteria set out in Chapters 2 and 5.

8.62 In general, within government research organisations, the categories proposed in Chapter 5 can be easily reported, although this may not be the case within some core government units. Whenever possible, a classification of researchers by seniority grade similar to that proposed in Chapter 9 may be useful for the purpose of documenting the organisation of R&D within government institutions. The categories include typical positions for each group (EC, 2013: 87):

- Category A: The single highest grade/post at which research is normally conducted.
 - ❖ Example: “director of research”.
- Category B: Researchers working in positions not as senior as top position (A) but more senior than newly qualified doctoral graduates (ISCED level 8).
 - ❖ Example: “senior researcher” or “principal investigator”.
- Category C: The first grade/post into which a newly qualified doctoral graduate would normally be recruited.
 - ❖ Examples: “researcher”, “investigator” or “post-doctoral fellow”.
- Category D: Either doctoral students at the ISCED level 8 who are engaged as researchers, or researchers working in posts that do not normally require a doctorate degree.
 - ❖ Examples: “Ph.D. students” or “junior researchers” (without a Ph.D.).

8.5. Methods for compiling R&D expenditure and personnel in the Government sector

The statistical and reporting units in the Government sector

8.63 Government units that should be covered by surveys include:

- R&D institutes, laboratories and centres
- R&D operations of general administrations of central/federal, regional/state or municipal/local government, statistical, meteorological, geological and other public services, museums and hospitals
- R&D operations at all levels of government (where appropriate: central/federal, regional/state, and municipal/local).

8.64 The statistical unit will generally be the department, ministry or agency, even if the unit does not have all of the characteristics of an institutional unit (e.g. individual ministries often lack the ability to hold and control assets separately from the ensemble of the central/federal [or regional/state] government). The desired attributes of the sampling unit for the Government sector include: branch of activity, geographic location and level of government. The reporting unit will be dependent on the entity that is best capable of reporting. This may include the whole of government in the case of regional/state or municipal/local governments.

8.65 If available, the survey frame should be linked to a central statistical register. This would assist in the integration of data from various sources and simplify classification decisions. It would also reduce the risk of double counting units if approached from different perspectives.

8.66 Particular attention should be paid to the use of administrative data in the identification of R&D performing and funding institutions. In some countries, these would include institutions that could identify R&D expenditures as a second-level COFOG.

8.67 It is especially difficult to identify R&D activities at the local (and in some countries, the regional/state) government level owing to the large number of units, the small number of likely R&D performers and difficulties in the interpretation of the concept of R&D. If local governments undertake a significant amount of R&D activity, it is advised to make the effort to include R&D performers in large local governments. Given the nature of many regional/state forms of government, they may perform R&D occasionally: it may not be core to the governments' department or agency mission to conduct R&D per se, but they need to address a specific problem identified by the legislature or the department. Therefore, some R&D activities may be temporary.

Survey data collection

8.68 It is standard practice to carry out a census of government units and organisations that are known or presumed to be performing R&D. For reasons related to the practical burden, typically these will only account for a relatively

small list of all known government units. Registers/directories of government departments, research institutes and statutory bodies, including a review of available legislation and budgetary actions, can help identify the possible R&D performers in the Government sector. Other sources of information could be academic or professional and stem from learned societies; research associations; lists of science and technology (S&T) service institutions; registers or databases of scientists and engineers; and databases of scientific publications, patents and other intellectual property documents, as well as requests for updates from administrative bodies.

8.69 Officials in charge of the compilation of R&D data should not understate the potential challenges of collecting this data from government institutions. A lack of underlying information in the format requested and limited buy-in can significantly affect the comprehensiveness and quality of the data collected. In the case of research institutes where the personnel have civil servant status, it is advisable that arrangements be made in advance, ensuring the buy-in of the senior civil servant in charge of the reporting institution. In general, it is recommended that an appropriate “outreach” programme be used to support data collection, involving the provision of respondent training packages, investigative studies to provide R&D terminology familiar to subnational government staff, and direct feedback on the results of the data collected.

8.70 Some institutions in the Government sector may report that all staff perform research and that their R&D personnel FTE is equal to or close to 100 percent (UNESCO-UIS, 2014). Although activities that are not R&D should be excluded, this may be difficult to apply in practice. Because government institutions differ in their orientation and institutional cultures, this manual advises *against* applying general “rules of thumb” whereby a fixed percentage of professionals in these institutions are deemed to be researchers. A systematic count will be expected from respondents. Where government institutions primarily engaged in S&T services undertake research in connection with this activity, such research activities should be clearly identified and systematically captured in the R&D survey.

Estimation of R&D expenditure and personnel

8.71 The estimation of R&D expenditures and personnel in the Government sector should pose *a priori* less of a challenge than for other sectors where complete enumeration is not the norm. However, given the scope for non-response and the limitations on the type of information that can be requested from government institutions, a number of strategies may need to be used.

8.72 In some cases, government information systems aimed at improving co-ordination and ensuring greater transparency may provide an adequate basis for collecting information on research work funded or performed by central government. Such systems may integrate all research and development projects funded or performed by a substantial part of government and allow the production of statistics on R&D performance by government units. In some

other cases, budgetary information may need to be used to address data gaps and quality-assure the consistency between surveys and totals.

8.73 The use of coefficients to estimate the structure of R&D expenditures or personnel within organisations is in general discouraged, because of the large heterogeneity between R&D performing units.

8.74 Whenever possible and where the quality of the collected data permits doing so, it is recommended to publish selected disaggregated data at the level of individually-named government institutions, as this may serve several other user needs.

8.6. Measuring government funding of R&D performance

8.75 As noted in Chapter 4, there are two main approaches available for measuring the cost of the resources that governments dedicate to fund R&D. One approach is performer-based reporting of the sums that a statistical unit or sector has received from government units for the performance of intramural R&D during a specific reference period. The second approach is funder-based reporting of the sums government units report having paid or committed themselves to pay to other statistical units or sectors for the performance of R&D during a specific reference period. The funder-based approach relies on the reporting made by government funding units, including for R&D performed within government, as well as funds for R&D to be performed outside government.

Performer-based approach (recommended)

8.76 The recommended approach for compiling figures of R&D funding by government is the performer-based approach, which is based on combining the funding levels reported by units in all sectors, including government. For a particular country, the aggregate total represents the total domestic R&D performance financed by the Government sector. This indicator, Government-financed GERD (GOV-financed GERD), should not be confused with GOVERD, which represents the Government sector's overall intramural R&D performance. The overlap between these two totals is the share of R&D performed within government that is internally funded by government out of its own resources.

8.77 The measurement of government funding of GERD relies on the robust measurement of sources of funds in all sectors. Most of the main challenges have been discussed at some length in Chapter 4 and the relevant sector chapters.

8.78 It is highly recommended that surveys of R&D performers in all non-government sectors provide a breakdown of funds received from government according to whether the funds are provided in exchange for R&D or as a transfer. This information is of particular relevance for policy makers and for building a better understanding of the policy instruments used to support R&D. This information is also of relevance to the production of capital investment series in national accounts.

8.79 The implementation of the performer reporting approach, however, can present some difficulties when dealing with specific forms of government financial support for R&D. For example:

- The use of dedicated forms of **tax relief** with the aim of encouraging the funding or performance of R&D has been addressed in Chapter 4 and is the focus of dedicated guidance in Chapter 13. With some specific exceptions, most modes of tax support for R&D cannot be easily aligned formally and in practice to this manual's concept of R&D performance. For this reason, the capture of this form of support is primarily undertaken from a source perspective and, in international comparisons, generally excluded from analyses of statistics on government-financed GERD.
- **Loans for R&D** provided by government, as well as other financial investments aimed at providing financial resources for R&D in other sectors, should be treated as internal performer funds (Chapter 4). Financial investments represent an exchange of financial assets (e.g. cash in return for future repayments at an agreed interest, or a claim on an institution's profits). While it is possible that such an investment may not be repaid or that the interest charged implies a subsidy, it is deemed impractical to ask performers to estimate and reveal its implicit value.
- **Free or sponsored use of government facilities for R&D.** For practical reasons, it is impossible to secure reliable estimates from R&D performers of the economic value of the services secured or its equivalent implicit subsidy. In some cases and as previously noted, the cost of services that is not charged to users may be allocated to the R&D performance of the service provider for a better aggregate representation of the full R&D effort.

Funder-based approach (complementary)

8.80 While this manual highlights the importance of ensuring a common and consistent approach based on the reporting of R&D by performers (through surveys and other, justifiable, auxiliary methods), it also acknowledges a range of complementary practices intended to improve the quality, timeliness and relevance of R&D statistics. The reference to such practices is based on the experience within a number of countries that have already been developing source-based statistics on how much R&D is funded by government, for performance within and outside government.

8.81 In many cases, data on the funding of extramural R&D by government units can be used to address reporting gaps from performers, and thereby improve the quality of R&D performance statistics. This may apply for example in the case of funding being provided for individuals, for example, students or scholars, to engage in R&D performance at other units, without these units having direct control over the funding (see Section 4.4). This arrangement may be intended to allow individuals to move freely from one organisation to another. Data from government funding sources may thus allow a more complete representation of

the overall R&D performance. It is however necessary that the host organisations have a formal record of the presence and contribution made by such individuals, for otherwise it may be impossible to demonstrate compliance with the criteria for R&D outlined in Chapter 2.

8.82 Another example of the application of funder-based statistics is the use of budgetary funding measures to help estimate general funding for universities, with the assistance of coefficients on the use of those general resources (see Chapter 9).

Government budget allocations for R&D (recommended)

8.83 This manual provides guidance on the collection of data on government budget allocations for R&D (GBARD) in Chapter 12. The main rationale for this budget-based approach is the greater timeliness of the data (including budget plans) and the ability to provide a first-order approximation to the distribution of government R&D funding levels by socioeconomic objective.

Statistical enquiries on government funding of R&D (optional)

8.84 As previously noted, it is recommended that surveys of government units include questions on the funding by these units of R&D performed extramurally. In general, these surveys cannot be used to construct aggregates of government funding unless their coverage is expanded to cover not only R&D performing units in the Government sector but also other units that only undertake R&D funding roles.

8.85 The potential relevance of these data further derives from the additional information elements that can be collected through specifically targeted questions on the funding of both intramural and extramurally performed R&D, which standard budgetary information cannot provide in sufficient detail. A number of examples can be provided, indicating potential areas of development within countries for which it is not possible at present to provide common guidelines.

More detailed information on individual government sources of R&D funds

8.86 One possible advantage of government funder-based surveys is that they may allow a more detailed accounting of which government institutions provide funds for R&D performed by units in each of the economic sectors. While surveys of R&D performers in the Business enterprise, Higher education and Private non-profit sectors ask for data on total government funds for R&D, it may be particularly burdensome to ask respondents to identify the individual government units that are the source of such funds. Surveys of individually identified government R&D funders asking for R&D funding totals provided to extramural R&D performers, by sector, do not have this limitation.

Funding by government of R&D performed abroad

8.87 Indicators of R&D funding by government for performers abroad and in international organisations (all part of the “Rest of the world”) cannot be obtained from surveys of domestic performers. Similarly, information on government contributions to programmes and institutions developed in partnership with other countries’ governments or supranational organisations can be of significant policy relevance to the extent that it may enable the monitoring of international collaboration on R&D and the extent to which bilateral or multilateral agreements are actually supported by government funding.

Funder-based information on modes of funding

8.88 Information could be collected indicating the extent to which funds are provided as a transfer (as in a standard type of grant or contribution agreement) or in exchange for R&D services (as in many forms of government R&D procurement) (see Chapter 4). For a number of reasons, the perspective provided by funders may differ substantially from that of performers, who may possibly report external funding as internal and therefore understate the true extent of funding from government.

8.89 Information could be collected on a number of other policy-relevant dimensions of modes of funding, such as the extent to which the funding is allocated on a competitive basis (versus other criteria) or is allocated on a programmatic or project basis instead of as institutional allocations. Under an institutional mode of funding, the organisations receiving funding have full discretion over the type of R&D projects and activities that they can undertake, whereas funding provided on a project or programmatic basis leaves more limited room for decision. Public general university funds (GUF) for R&D are a particular case of institutional R&D funding, aimed at higher education institutions, to which this manual assigns special status (see Chapters 4, 9 and 12). It is important to note that when block funding recipients can decide on whether the funds are to be used for R&D or other purposes, it is unlikely that what funders report as funding allocated on R&D-based criteria – for example, on past scientific publication performance – will necessarily coincide with what performers report as being used for R&D.

Challenges of statistical enquiries on R&D funding by government

8.90 The comprehensive collection of data on R&D funding by government units entails a number of practical challenges to take into account:

- The availability of additional data requires additional efforts to “reconcile” differences between budget-based data and reports on government sources of funds from all domestic performing sectors. If information is collected on the sectoral affiliation of the likely performers, this may give rise to a different performance-funder matrix from that derived from performer-based

surveys. This entails a non-negligible risk of confusion among data users if not appropriately described and explained.

- The approach also requires extending the coverage of government R&D surveys to non-R&D performing government units, which may have some resource and burden implications. The burden placed on government agencies will depend on the extent to which the information is already available, at least internally for other administrative purposes, and whether these align with the intended statistical concepts.
- In order to implement a funder-based approach, there is a need to address the potential double counting of R&D funds provided by “intermediary” agencies that receive funds from ministries and agencies and then re-allocate and pass through funds to other performing institutions. This also requires developing clear criteria on how these funds are distributed across functional categories. For example, the funds provided by a ministry to a major funding council may align with the “general advancement of knowledge” objective, while the agency’s own funding of R&D at the project or programme level may register funding on a more granular basis.

8.91 Table 8.3 provides a schematic representation of the various situations that a government agency engaged in both R&D funding and performance may find itself in if confronted by a questionnaire on R&D performance and funding activities with third parties. This table shows that for computing aggregate estimates of R&D funding by the Government sector, it would be necessary to either focus on funds ultimately provided to R&D performers or focus on the first-time allocation of funds. In general, respondents can be asked to include the amounts transferred to other agencies to support research and development, but in that case the receiving agencies should not report funds transferred to them. Similarly, a subdivision of an agency that transfers funds to another subdivision within that agency could report such outlays as its own. To ensure that no undue distortion of funds for intramural R&D performance takes place, the agency transferring the funds should make a special effort, within practical limits, to determine whether the ultimate performer is intramural or extramural, and report accordingly. The transfer of funds to another government agency should not be the sole basis for reporting that the R&D performance is intramural.

8.92 Discrepancies with either budget-based data or data on expenditures for R&D performance may arise, depending on whether government units are asked to report their outlays on a cash or accrual basis. Cash or related payments may be made in a different period with respect to the year in which the use of funds by the agency was approved, and this may also in turn be different from the point at which the commitment is made to pay a given performer, and also the time at which R&D performance is deemed to be accrued.

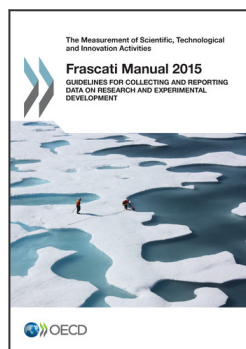
Table 8.3. **Flows of funds perspective for a government R&D funding and performing agency**

Funds available to agency	Agency's use of funds	Possible ultimate use of funds	Intra / extramural R&D performance
Internal or other government sources, including budget, and funds retained from previous years	Funds retained	Intramural R&D within the government agency	Intramural
		Spending decision deferred	Not applicable
	Funds passed through	Agency delegates R&D funds allocation decision to another agency	Potential for double counting
		Funds allocated to performers through grants, R&D procurement, subcontracted R&D, etc.	Extramural Potential for double counting
Other external sources	Funds retained	Intramural R&D within the government agency	Intramural
		Spending decision deferred	Not applicable
	Funds passed through	Agency delegates R&D funds allocation decision to another agency	Potential for double counting
		Funds allocated to performers through grants, R&D procurement, subcontracted R&D, etc.	Extramural Potential for double counting

8.93 A number of countries already collect R&D performance and funding within the entire Government sector in a systematic fashion. Countries that wish to experiment with this approach are encouraged to do so. However, further work is needed in order to bring convergence towards a standard for conducting comprehensive surveys of R&D funding by governments.

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From:

Frascati Manual 2015

Guidelines for Collecting and Reporting Data on Research and Experimental Development

Access the complete publication at:

<https://doi.org/10.1787/9789264239012-en>

Please cite this chapter as:

OECD (2015), "Government R&D", in *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264239012-10-en>

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