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Total **Investment in Research and Innovation (TWIN)** 2013-2019

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This report by the Rathenau Instituut presents statistics on the national government's direct financial support and indirect fiscal support for Research & Development (R&D) and innovation for the 2013-2019 period. The report also discusses R&D and innovation investments from regional and international sources.

Contents

1 Summary

Total Investment in Research and Innovation 2013-2019 (in Dutch: TWIN)[1] surveys the Dutch national government's financial support on R&D and innovation, based on the 2015 budgets of various ministries. This report takes into account both the budgetary measures laid down in the 2012 Government Coalition Agreement [regeerakkoord] and the supplementary budgetary agreements for 2014 (concluded in October 2013). We have surveyed both direct expenditure (such as fixed grants allocated to institutions, subsidies, and research programme funding) and indirect support (tax incentives). The report covers the 2013-2019 period. We have surveyed the various ministries' data on R&D and innovation for the 2015 budget year and the two previous years, and

1 The TWIN report is drawn up annually following a survey of the ministries and their budgets. The report was previously known by the Dutch acronym TOF (for Total Research Funding). The name was changed in 2014 with the 2012-2018 report when more data on the national government's expenditure on innovation began being collected.

The Rathenau Instituut promotes the formation of political and public opinion on science and technology. To this end, the institute studies the organization and development of science systems, publishes about social impact of new technologies, and organizes debates on issues and dilemmas in science and technology.

provide a forecast for the 2016 to 2019 period. This report also addresses international and regional financing, as well as two specific government instruments: Small Business Innovation Research (SBIR) and innovation procurement, also referred to as innovation-specific contracting.

The most important results are:

- Despite increasing expenditure on R&D several times (based on measures from the Government Coalition Agreement of 2012 and the supplementary budgetary agreements for 2014 made in 2013), there will be a drop in government support for R&D and innovation in the 2013-2019 period. This decrease will be felt in three separate categories: direct expenditure on R&D, direct expenditure on innovation, and indirect fiscal support. Total expenditure will drop from EUR 6 billion to EUR 5.5 billion. Direct R&D expenditure will decrease by 6.3 per cent, direct expenditure for non-R&D innovation by 46.3 per cent, and fiscal support by 7.2 per cent. Government support will decrease by a total of 7.6 per cent.
- If government expenditure on R&D is classified according to the primary purpose of the funding, it becomes clear that the lion's share of R&D expenditure is allocated to university research (=general university funds) and other non-application-oriented research. The share of both of these streams will increase in the 2013-2019 period as well, from 69 to 76 per cent. Whereas, in absolute terms, R&D expenditure for these two categories will increase by a few percentage points, R&D expenditure for every other category will drop, by between 4 per cent for defence and 40 per cent for technological objectives.
- There are other public funds available for R&D and innovation aside from those provided by the Dutch national government: funds from the European Union (EU) and regional funds. Dutch researchers are acquiring an increasing share of their funding from the EU through the European Framework Programmes (FPs). This has become an option through the greater scope of the FPs, combined with a better return percentage. The average annual income from FPs has risen over the last fifteen years, from approximately EUR 165 million to EUR 475 million. Regional funding (some of which originates from the EU, but not through a FP) is also available for knowledge and innovation, with funding being exchanged between provinces, regional development companies, management authorities, and other regional organisations. Estimates are that, in 2014, some EUR 100 million was spent on knowledge and innovation at regional level, but that that amount will increase in the coming years because new programmes are being launched. The European and regional funding was below 10% of the amount in funding that the national government provided for R&D and innovation in 2014.

Table 1 provides a summary of the estimated expenditure for R&D and innovation for the 2013-2019 period, both in terms of direct financial expenditure (including innovation-relevant expenditure) and indirect fiscal support. Table 1 contains the absolute amounts. Table 5 links these amounts to the GDP, which provides insight into how the expenditures relate to the overall economy.

Table 1 Direct and indirect financial support for R&D and innovation, 2013-2019, in millions of euros

	2013	2014	2015	2016	2017	2018	2019
Direct expenditure on R&D	4,794.3	4,924.5	4,779.7	4,631.0	4,546.6	4,485.3	4,491.4
- -of which innovation-relevant	*1,082.9*	*1,259.8*	*1,176.6*	*1,072.0*	*1,043.2*	*1,017.3*	*1,007.5*
Direct expenditure on non-R&D innovation	165.8	185.2	136.9	114.2	103.1	98.7	89.0
Indirect fiscal support for R&D and innovation	1,003.1	1,068.6	1,042.6	945.7	930.6	930.6	930.6
Total	**5,963.2**	**6,178.3**	**5,959.2**	**5,690.9**	**5,580.3**	**5,514.5**	**5,511.0**

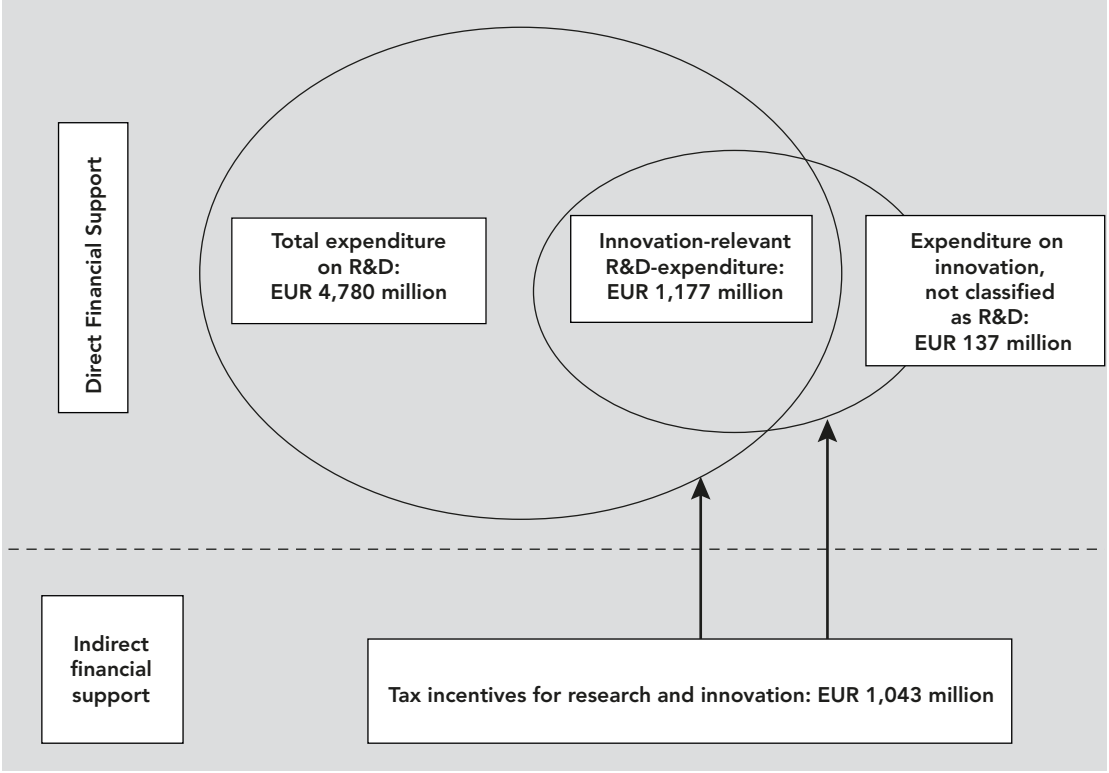
Note: The fiscal support for R&D and innovation excludes the Innovation Box, a corporation tax incentive.

The largest share of government support for R&D and innovation – approximately 80 per cent – consists of direct expenditure on R&D, part of which is innovation-relevant. This expenditure included outlays for university research (general university funds), research performed by public research institutions and companies, and for research contracted by the government.

Funding was increased in the three main categories between 2013 and 2014, but that amount will drop between 2015 and 2019. Only indirect fiscal support will remain stable from 2017 onwards.

Figure 1 illustrates the interrelationship of the various categories for the year 2015: expenditure on R&D - innovation-relevant and otherwise - direct expenditure on innovation, and indirect fiscal support.

Figure 1 Direct and indirect financial support for R&D and innovation, 2015



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2 Data collection

As did the previous TWIN report, this Facts & Figures publication provides statistics about both government expenditure on R&D and government expenditure on innovation. International agreements have been reached on the scope and definition of the term R&D, and these have been laid down in the OECD's Frascati Manual.[2] No such agreements have been reached, however, on government budgets for innovation. We attempted to define the term innovation in the previous TWIN report using the OECD terminology for collecting data on innovation in industry. Applying that definition in practice is not so simple, though, because it is general in nature and has to be applied to specific budget items. This means that we will have to co-operate with the ministries in the coming years to further refine the application of the term innovation to budget expenditures.

2 www.oecd.org/sti/frascatimanual. The first edition of this OECD manual (OECD = the Paris-based Organisation for Economic Cooperation and Development) dates from 1964. A new seventh edition of the Frascati Manual is being drafted, with publication expected in October 2015.

The two most important premises for collecting data on R&D and innovation are:

a) Owing to international agreements (an EU-EUROSTAT Regulation concerning the delivery of data on government expenditure on R&D), it must remain possible to make a distinction between R&D expenditure and innovation expenditure that does not involve R&D.
b) The term innovation expenditure must be defined (as well as the term R&D expenditure) as consistently as possible with international definitions, to the extent such are available.

We define government budgets for innovation as expenditure that is aimed at financing activities (scientific, technological, organisational, commercial) that are primarily geared towards and intended to generate innovation in the private or public sector, leading to:

– new or vastly improved products,
– new or vastly improved processes / methods,
– new or vastly improved services,
– administrative, organisational or marketing innovation.

To keep that delineation practicable, the collection of data on innovation budgets is based on a limitation. It must relate to government initiatives, measures, or interventions that:

a) promote innovation (strengthening the capacity for innovation in the Netherlands);
b) use innovation as a means, for example to achieve a specific policy goal;
c) combine these two premises.

The first and third situations primarily regard expenditure by the Ministry of Economic Affairs. The second situation would apply to expenditure by the various ministries. An example of this would be using a health care innovation to improve health care. The delineation excludes expenditure that is not clearly linked to generating an innovation or that would not contribute to innovation except in the longer term. Examples include general expenditure on education and the general university funds.

Data collection is based on a questionnaire sent to the ministries to take stock of the following categories of government expenditure:

a) institutional funding of R&D (fixed amounts allocated to institutes), with the ministries being asked to indicate the innovation-relevant portion;
b) project funding of R&D (both projects and programmes), with the ministries being asked to indicate the innovation-relevant portion;
c) other expenditure on non-R&D innovation;
d) tax schemes for both R&D and innovation.

Where expenditures are concerned, the questionnaire requests a statement of the R&D portion of the budget item, the purpose of the expenditure (to the extent possible), and the type of expenditure (based on a classification of government objectives).

This TWIN publication contains the figures provided at ministry level. Detailed figures (in Dutch only) on R&D expenditure at item level, innovation-relevant R&D expenditure, and non-R&D innovation-relevant expenditure can be accessed via http://www.rathenau.nl/web-specials/de-nederlandse-wetenschap/cijfers/cijfermateriaal/achtergrondcijfers-feiten-cijfers.html.

3 Direct R&D expenditure by ministry

Table 2 shows R&D expenditure by ministry for the 2013-2019 period and is based on the 2015 budgets. The figures for 2013 are actual outlays. The figures for 2014 are obligations for that year in so far as known when the provisional budgets for 2015 were published (on Budget Day, 16 September 2014). For 2015, the figures are taken from the budget proposal. The figures for 2016-2019 are multiyear forecasts.

Table 2 Direct R&D expenditure by ministry (cash basis), in millions of euros

	2013	2014	2015	2016	2017	2018	2019
Ministry of General Affairs	0.5	0.6	0.6	0.6	0.6	0.6	0.6
Ministry of Foreign Affairs	59.1	53.3	44.3	42.5	42.3	42.3	42.3
Ministry of Security and Justice	22.1	22.2	21.5	21.1	20.7	20.5	20.5
Ministry of the Interior and Kingdom Relations	19.4	20.4	19.9	19.8	19.7	19.7	19.5
Ministry of Education, Culture and Science	3,319.7	3,414.2	3,470.6	3,444.8	3,423.2	3,407.0	3,415.3
Ministry of Defence	59.2	62.8	58.4	57.2	57.0	57.0	57.0
Ministry of Infrastructure and the Environment	100.1	61.0	57.0	50.4	46.2	44.7	44.8
Ministry of Economic Affairs	958.8	1,044.1	882.8	777.4	743.0	711.1	702.3
Ministry of Social Affairs and Employment	0.6	0.6	1.3	1.4	1.4	1.4	1.4
Ministry of Health, Welfare and Sport	255.0	245.6	223.1	215.5	192.6	181.1	187.0
Total	**4,794.3**	**4,924.5**	**4,779.7**	**4,631.0**	**4,546.6**	**4,485.3**	**4,491.4**

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Note: The figures for Education, Culture and Science include the general university funds for research. The Rathenau Instituut has provided an estimate of that amount. The Education, Culture and Science figures include the research funding made available to Wageningen UR by Economic Affairs. The figures for Economic Affairs exclude this contribution (estimated in 2015 at approximately EUR 100 million).

Total direct government funding for R&D will decline between 2013 and 2019 by 6.3 per cent, from EUR 4.8 to EUR 4.5 billion (a decrease of EUR 303 million). The downward trend was evident in previous reports on government expenditure on R&D and is the result of measures set out in the government Coalition Agreements of 2010 and 2012. The decline is less pronounced than in the previous TWIN report for 2012-2018; the amount at that time was EUR 566 million. The measures include phasing out the innovation programmes funded by Economic Affairs ('EZ') and the projects that the various ministries finance out of the Economic Structure Reinforcement Fund [*Fonds Economische Structuurversterking*] ('FES') and budget cuts on the TO2 institutes for applied research (TNO, the Energy Research Centre of the Netherlands or ECN, the Maritime Research Institute Netherlands or MARIN, Deltares and the National Aerospace Laboratory or NLR, and the research institutes at Wageningen University and Research Centre). Subsidies encompassing R&D will also be cut. The largest cut in an absolute sense will be made at EZ (absolute: EUR 257 million, relative: 27 per cent). The steepest relative decline, 55 per cent, can be seen at the Ministry of Infrastructure and the Environment ('I&M'). R&D expenditures will also be cut by 28 per cent at the Ministry of Foreign Affairs ('BZ') and 26 per cent at the Ministry of Health, Welfare and Sport ('VWS').

4 Indirect financial support for R&D and innovation

In addition to providing direct funding for R&D, the government can also provide indirect support, specifically, tax incentives. The Netherlands has had this R&D scheme in place since the mid-1990s: the Research and Development Promotion Act [Wet Bevordering Speur- en Ontwikkelingswerk] ('WBSO'). The aim of this scheme is to promote R&D, particularly at small companies, so that it leads to innovation and economic growth. The Research & Development Deduction ('RDA') was added in 2012. The WBSO is a scheme to reduce taxation on R&D-related labour costs. Figures provided by RVO.nl[3] show that small and medium-size enterprises ('SMEs') accounted for 97 per cent of the taxpayers who availed themselves of WBSO incentives in 2013.[4] Seventy-two per cent of the incentives granted in

3 On 1 January 2014, NL Agency merged with the Dienst Regelingen to form the Netherlands Enterprise Agency [Rijksdienst voor Ondernemend Nederland, RVO.nl]. The agency helps entrepreneurs obtain grants, find business partners, identify know-how and comply with laws and regulations. Part of the Ministry of Economic Affairs, it works at the behest of ministries and the European Union.

4 http://www.rvo.nl/sites/default/files/2014/07/Focus%20op%20speur-%20en%20ontwikkelingswerk%20van%20de%20WBSO%20RDA%20in%202013.pdf (in Dutch only).

2013 went to SMEs. The RDA scheme allows businesses to deduct a larger amount of tax for R&D investment and commercialisation. Businesses must submit their RDA and WBSO applications simultaneously. RVO.nl administers both the WBSO and the RDA scheme. The actual benefit is set off through the tax returns filed with the Dutch Tax and Customs Administration [*belastingdienst*].[5] There are caps on tax incentives. If that cap is exceeded in a given year, then the excess is deducted from the budget for the years thereafter.

In addition to the innovation-related tax schemes embodied in the WBSO and RDA, the Innovation Box and several environment-related schemes are available as well. Part of the primary corporate tax structure, the Innovation Box is a special tax regime for income generated from self-developed intangible assets for which a patent has been granted or for which an R&D certificate[6] has been issued in the research phase. Under certain conditions, the net income so generated is taxed at a much-reduced effective rate of five per cent. The Innovation Box is not counted as budgeted tax expenditure[7] and therefore does not appear among the tax expenditures listed in Appendix 5 of the Budget Memorandum or other multiyear budget statements. This is why the funds for the Innovation Box are excluded from the TWIN figures. When the Innovation Box regime was introduced, the annual structural cost to government was forecasted at EUR 625 million. The Innovation Box cost the government EUR 345 million in 2010 and EUR 601 million in 2011, with the cost for 2012 being estimated at EUR 852 million.[8] The environment-related schemes have a minor R&D and innovation component.

Box 1: EU assessment of tax incentives

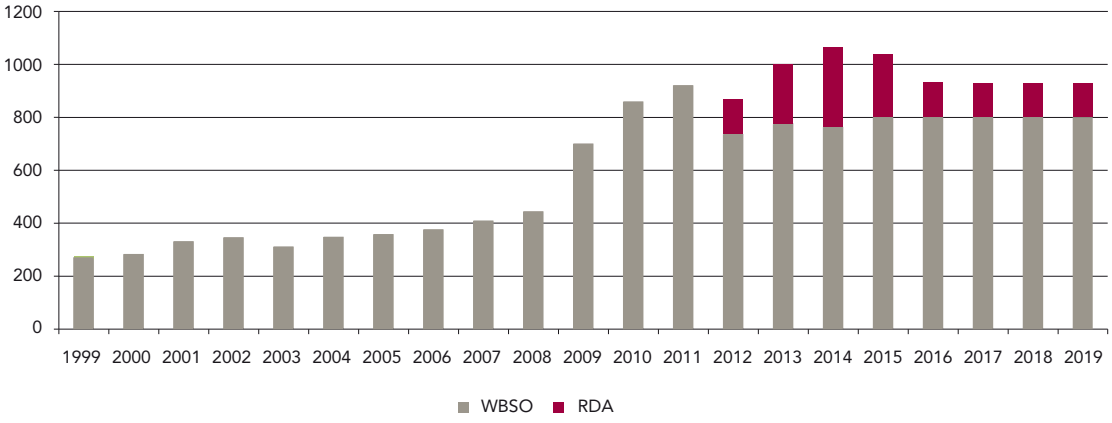
At the end of 2014, the European Commission published a report on, inter alia, the effectiveness of tax incentives in 26 EU Member States and 5 other countries.[9] Not only has the number of countries that have introduced tax incentives increased sharply over the years, but the budgets for those incentives have as well. The incentives differ considerably from country to country. A review of the literature indicates that most studies show that while tax incentives do promote R&D, there are differences in effectiveness. The authors cautiously conclude that a country wishing to increase its R&D expenditure by 1% will have to spend the same amount on tax incentives. There is little empirical evidence of their ultimate effect on innovation and economic growth. The study also shows that there is no relation between a country's innovativeness and the amount it makes available in tax incentives (the most innovative European countries, such as Germany, did not even offer a tax incentive in 2011). There are few studies that compare the effectiveness of tax incentives with that of direct funding, and those that do exist conflict with one another. One thing that is clear, however, is that tax incentives can only be effective in an environment that is conducive to entrepreneurship.

The report is fairly critical regarding the patent box phenomenon, which the Netherlands refers to as the Innovation Box. Large companies could use this incentive to reduce their tax obligations by transferring their patents from one country to another.[10]

5 In practice, approximately 85 per cent of the amounts granted are actually used.
6 RVO.nl issues R&D certificates [S&O-verklaringen] for R&D activities to which the WBSO tax incentive applies.
7 A budgeted tax expenditure means that the government budget (Budget Memorandum) has identified a budget for the relevant tax facility.
8 Figures based on the Letter of 13 January 2015 from the State Secretary of Finance to the House of Representatives containing data on the use of the Innovation Box in the 2010-2012 period.
9 http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_papers/taxation_paper_52.pdf. The Dutch CPB (Netherlands Bureau for Economic Policy Analysis) led the consortium that conducted the study. Box 1 is partly based on a CPB article on the study, which can be accessed at: http://www.voxeu.org/article/rd-tax-incentives-new-evidence-trends-and-effectiveness.
10 The figures on the use of the Dutch Innovation Box indicate that 60 per cent of the budget is allocated to companies with more than 250 employees, comparable with the share of R&D expenditure.

Figure 2 provides a financial overview of how the WBSO[11] and the RDA have developed since 1999.[12] The amounts in tax incentives rose sharply in the 2008-2014 period, only to begin declining starting in 2016. Initially, the RDA was intended to reach a level of EUR 500 million per year, but most of the cuts in tax incentives for R&D and innovation have been made at RDA level.[13]

Figure 2 Tax incentives for R&D and innovation in the Netherlands, in millions of euros



Source: RVO.nl (1999-2012) and EZ's 2015 budget for 2013-2019

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There is international consensus that looking exclusively at direct R&D funding results in an incomplete picture of total publicly funded support for R&D. OECD data shows that there are significant differences in the amounts the various countries grant in tax incentives.[14] In 2011, fiscal support as a percentage of GDP varied from 0.26 per cent for France, to 0.02 per cent for South Africa. The figure for the Netherlands was 0.15 per cent. See also Figure 4 in Facts & Figures TWIN 2012-2018.[15]

11 The WBSO consists of two components: a deduction for self-employed persons and a tax break for companies. The first component is rather minor (< EUR 10 million).

12 Several tax incentives provided by I&M are excluded from Figure 2 because they are rather minor (between EUR 2 and 3 million).

13 A proposal has been made to combine the WBSO and the RDA with effect from 1 January 2016, which means that, starting in 2016, the separate budgets available for WBSO and RDA will only be technically separate.

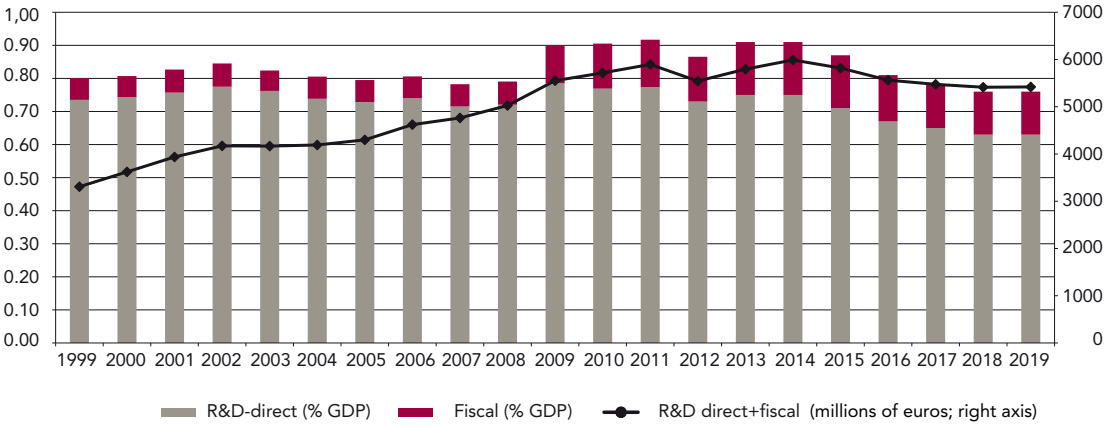
14 Meer informatie over fiscale instrumenten in internationaal perspectief is te vinden op het Innovation Policy Platform van de OESO: https://www.innovationpolicyplatform.org/ipp/filters/result-page?topic-filters=12359.

15 http://www.rathenau.nl/en/publications/publication/total-investment-in-research-and-innovation-twin-2012-2018.html.

5 Direct and indirect financial support for R&D

This section combines direct and indirect government support for R&D and considers the trend from 1999 onwards (Figure 3).

Figure 3 Direct and indirect government support for R&D, as a percentage of GDP and in millions of euros



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Source: The Rathenau Instituut for the direct government funding and NL Agency / RVO.nl and EZ for the indirect government support

The figure shows that direct and indirect government support as a percentage of GDP remained relatively stable (0.80-0.85 per cent in the 1999-2008 period). In the 2009-2011, partly as a consequence of the crisis measures, this increased to 0.92 per cent, only to decrease gradually starting in 2015 to below the level in 1999 (0.80 per cent in 1999 versus 0.77 per cent in 2018).

6 The most important changes in comparison with TWIN 2012-2018

Table 3 compares the figures from the TWIN report for 2012-2018 with the current TWIN figures for the 2013-2018 period. By comparing figures for the same years, Table 3 illustrates the changes that have taken place. For example, the figures for the year 2015 laid down in the report for 2012-2018 are compared with the figures for 2015 laid down in the report for 2013-2019. The table shows that actual outlays in 2013 were slightly lower than expected. In the 2014-2018 period, however, more will be spent on the three categories combined than was expected based on the report for 2012-2018. This is primarily the consequence of higher direct expenditure on R&D. Conversely, the direct expenditure on innovation and indirect fiscal support will be lower than stated in the report for 2012-2018.

Table 3 Comparison of TWIN 2012-2018 and TWIN 2013-2019: differences in millions of euros

	2013	2014	2015	2016	2017	2018
Direct expenditure on R&D (incl. innovation-relevant expenditure)	186.8	390.6	483.6	455.3	411.6	374.5
Direct expenditure on non-R&D innovation	-133.9	-62.6	-87.5	-63.2	-42.4	-38.9
Indirect fiscal support for R&D and innovation	-72.5	0.0	-57.1	-49.9	-50.0	-50.0
Total	**-19.6**	**328.0**	**339.0**	**342.3**	**319.2**	**285.6**

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If we examine the figures on direct expenditure on R&D in Table 3 more closely and allocate it by ministry, then we see in Table 4 that the most significant changes are occurring at the Ministry of Education, Culture and Science ('OCW'), EZ and VWS. We will look at this in greater detail in our discussion of the ministries.

Table 4 Comparison of direct expenditure on R&D between TWIN 2012-2018 and TWIN 2013-2019, by ministry: differences in millions of euros

	2013	2014	2015	2016	2017	2018
Difference at OCW	95.5	163.6	297.9	289.4	268.6	253.6
Difference at EZ	17.6	127.6	87.1	73.5	79.2	72.1
Difference at VWS	77.9	110.5	89.2	86.1	60.5	46.4
Difference at other ministries	-4.3	-1.0	9.4	6.3	3.3	2.4
Differences total	**186.8**	**390.6**	**483.6**	**455.3**	**411.6**	**374.5**

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Note: As in Table 3, the two TWIN reports are compared based a comparison of the same years.

To the extent possible, these figures include all relevant measures that impact ministry budgets. The most important trends will be dealt with below. Many of the trends in the ministries' research budgets were noticeable in the TOF reports for 2010-2016[16] and 2011-2017.[17]

- **Ministry of Foreign Affairs (BZ):** in comparison with the previous report, the decrease in the budget is less pronounced (increasing to EUR 5.5 million in 2018). The smaller decrease will benefit the budget for the country programmes.
- **Ministry of Education, Culture and Science (OCW):** expenditure at OCW, which will increase by nearly EUR 300 million in 2015, will gradually decline to a little more than EUR 250 million in the years thereafter. Two budget items are responsible for the lion's share of the increase: the general university funds and the primary funding of NWO,[18] amounting to EUR 125 million and EUR 140 million, respectively. Of the increase in the general university funds, EUR 85 million is attributable to an increase in the total lump sum provided to the universities, and EUR 40 million is attributable to a slight increase in the co-efficient that is used to calculate the research portion.[19] The increase in the NWO budget is attributable to a) a measure laid down in the 2012 Government Agreement, providing for a gradual increase from EUR 25 million in 2014 to EUR 150 million in 2018 and b) the 2014 budget agreements, pursuant to which EUR 100 million will become available starting in 2015. Part of the extra funds are intended for match-funding and co-financing European programmes. The fact that the budget will not be increasing by the sum of these two amounts is because, under the current administration, NWO is having to deal with the autonomous administrative authority reduction [*ZBO-korting*].[20]
- **Ministry of Economic Affairs (EZ):** the changes at EZ are primarily the consequence of a more detailed analysis of budget items in response to the delimited definition of innovation included in the 2015 EZ budget. This resulted in various budget items being shifted from the category of 'non-R&D innovation' to 'innovation-relevant R&D'. Furthermore, several new items were added to the innovation-relevant R&D category.
- **Ministry of Health, Welfare and Sport (VWS):** the increase in R&D expenditure in comparison with the previous TWIN figures is mainly the result of a shifting of funds from the category of 'direct expenditure on non-R&D innovation' to the category 'direct expenditure on R&D'. This shift explains the difference between the figures for the two TWIN periods. Specifically, this regards

16 http://www.rathenau.nl/publicaties/publicatie/feiten-en-cijfers-overzicht-totale-onderzoek-financiering-tof-2010-2016.html (in Dutch only).
17 http://www.rathenau.nl/publicaties/publicatie/totale-onderzoek-financiering-tof-2011-2017.html (in Dutch only).
18 In addition to primary funding from OCW, NWO also receives several specific subsidies from OCW, such as those for Talent Development and Large-Scale Research Infrastructure. The amounts of these subsidies have not changed.
19 Statistics Netherlands calculates this research co-efficient annually, and it increased from 57 per cent to 58 per cent.
20 This reduction is imposed on all autonomous administrative authorities [*zelfstandige bestuursorganen*].

contributions to FES programmes which also fall within the R&D category at other ministries, VWS' contribution to the top sectors, and the allowance for the availability of university-level care.[21] The decrease in the difference at VWS between the two periods relates to the phasing out of the FES programmes.

7 Government expenditure in relative and international terms

In order to put the figures in Table 1 into perspective, Table 5 contains figures on the three categories as a percentage of the GDP in the 2013-2019 period. Linking the figures to the GDP indicates the importance of the government's efforts to the economy and enables them to be compared with those of other countries.

The table is based on the most recent GDP data for the 2013-2016 period as issued by the Netherlands Bureau for Economic Policy Analysis (CPB), as well as a forecast of the trend between 2017-2019.

Table 5 Direct and indirect financial support for R&D and innovation, 2013-2019, as a percentage of GDP

	2013	2014	2015	2016	2017	2018	2019
Direct expenditure on R&D (incl. innovation-relevant expenditure)	0.75	0.75	0.71	0.67	0.65	0.63	0.63
Direct expenditure on non-R&D innovation	0.03	0.03	0.02	0.02	0.01	0.01	0.01
Indirect fiscal support for R&D and innovation	0.16	0.16	0.16	0.14	0.13	0.13	0.13
Total	**0.93**	**0.94**	**0.89**	**0.82**	**0.80**	**0.78**	**0.77**
GDP (in billions of euros)	642.9	654.5	672.1	690.1	699	707	716

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Note: The figures include the funds that are sent abroad, approximately EUR 200 million. The GDP for 2013-2016 is based on the most recent figures from the CPB (Short-term forecast dated March 2015; http://www.cpb.nl/cijfer/kortetermijnraming-maart-2015 - in Dutch only). The Rathenau Instituut forecasts GDP growth after 2016 at a volume growth of 1.25 per cent per annum.

The table shows that, unless additional investments are made, the government will also be providing less direct and indirect financial support for R&D and innovation in a relative sense. In other words, government expenditure will not keep pace with economic growth. This is in line with the figures in earlier reports. The fact that the increase in R&D expenditure (see Table 3) has not led to an increase in the GDP percentage is attributable to a revision and increase in the GDP starting with 1995, which Statistics Netherlands implemented in 2014.[22]

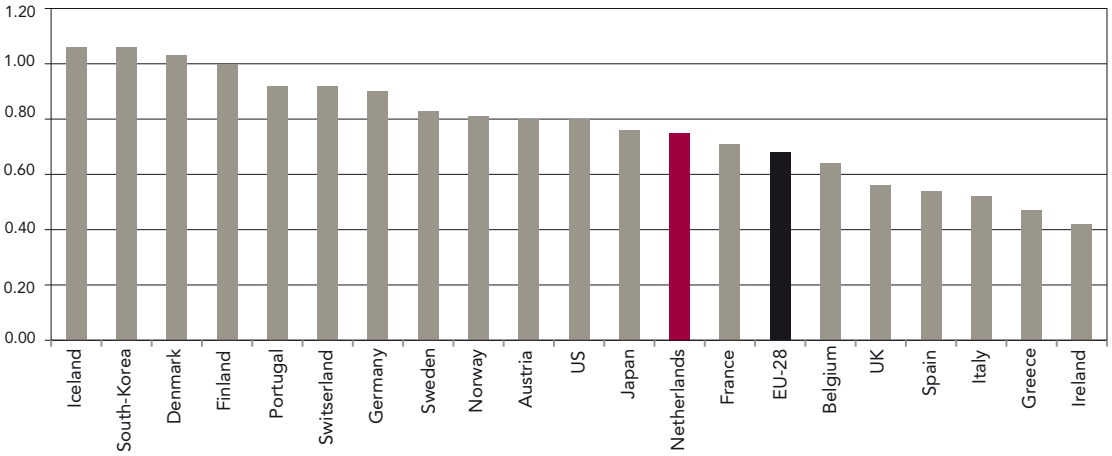
How does direct government expenditure in the Netherlands compare with that of other countries? Do governments in other countries spend more than the Dutch government? The GDP percentage enables the Netherlands to be compared with other European and non-European countries. Figure 4 shows that the Netherlands does not rank quite at the top with regard to government expenditure on R&D, but the country does rank higher than the EU average (0.75 versus 0.68): higher than several EU Member States, but lower than several countries with which the Netherlands would like to see itself compared. There is no data on long-term government investment available for the other countries in this figure. That makes it impossible to say anything about the Netherlands' international standing in the years ahead. This is also partly due to the fact that the trends for the other countries in the figure vary. Figures from EUROSTAT show that, in most countries, just as in the Netherlands, the relative

21 In conjunction with their public duties – providing top-level care and research and innovation – the university hospitals receive a subsidy in the form of an allowance for the availability of university-level care. Part of that allowance is allocated to the innovation-relevant R&D category.

22 Similar revisions were made in other countries as well.

government budget for R&D increased between 2000 and 2010, but then fell, as it did in the Netherlands, between 2010 and 2013.

Figure 4 Direct government budgets for R&D as a percentage of GDP, 2013[23]



Source: EUROSTAT (figures based on GBAORD and the revised GDP); Switzerland – 2012, South Korea – 2011
Note: Figures include funds sent abroad.

8 Direct government expenditure on R&D according to type of expenditure

Direct expenditure on R&D can be classified in various ways. This report classifies it in two ways: based on the funding type that governments use to 'market' their R&D budgets, and based on the goals that governments have for their R&D budgets.

Funding type: institutional funding and project funding

Institutional funding consists of funding allocated to institutions but not earmarked for any particular projects or programmes. The institutions do not need to compete to obtain this funding. One example are the general university funds. Universities have the liberty to spend the funds at their discretion. TNO's demand-driven funding is also categorised under 'institutional funding' because TNO is not required to compete for these funds.

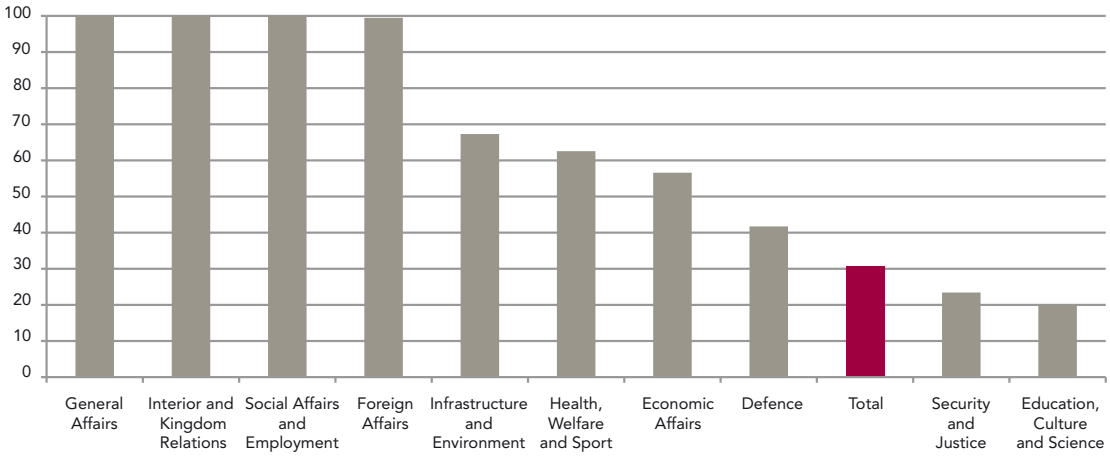
Project or programme funding is funding allocated to a group or individual to conduct research activities that are subject to scope, budget and time restrictions. In many cases, the funds are distributed through a competition. Examples include contract research commissioned by the ministries and the calls for research proposals issued by NWO.

Not all R&D expenditure falls into one of these two categories, however. Nor are the categories strictly defined; combinations are also possible. This terminology makes it possible to get an overall idea of how the ministries allocate their funds and to identify trends that develop over the course of time.

Various sources[24,25] indicate that project funding from the Dutch government shows an upward trend over a longer period of time, up to a level of approximately 30 per cent. In the coming years, that percentage will decrease slightly to approximately 28 per cent. This percentage is higher than in the previous TWIN report, which forecast a decrease to 24 per cent in 2018.

23 In international analyses, the government budgets are referred to as Government Budget Appropriations or Outlays on R&D (GBAORD).
24 Versleijen, A. et al. (ed.) (2007). *Thirty years of public research funding in the Netherlands 1975-2005* [Dertig jaar publieke onderzoeksfinanciering in Nederland 1975-2005]. The Hague: Rathenau Instituut (in Dutch only).
25 Steen, J. van (2012). *Modes of Public Funding of Research & Development: Towards Internationally Comparable Indicators*. OECD Science, Technology and Industry Working Papers, 2012/04. Paris: OECD Publishing.

Figuur 5 Share of total R&D expenditure accounted for by project funding, by ministry, 2015, in percentages of the total



Source: Rathenau Instituut database

Figure 5 shows significant differences between the ministries in terms of how they 'implement' their research funds. Some ministries work only with project funding (General Affairs (AZ), Interior and Kingdom Relations (BZK), and Social Affairs and Employment (SZW)). Without exception these are ministries that have small research budgets. There are also ministries that mainly provide institutional funding, such as OCW and Security and Justice ('VenJ'). The sizeable share of institutional funding at OCW is mainly attributable to the fact that it provides structural funding (= general university funds) to universities. The lump sum for universities is equal to two thirds of the ministry's research budget.[26] EZ takes a more middle-of-the-road approach, with just over 50 per cent in project funding.

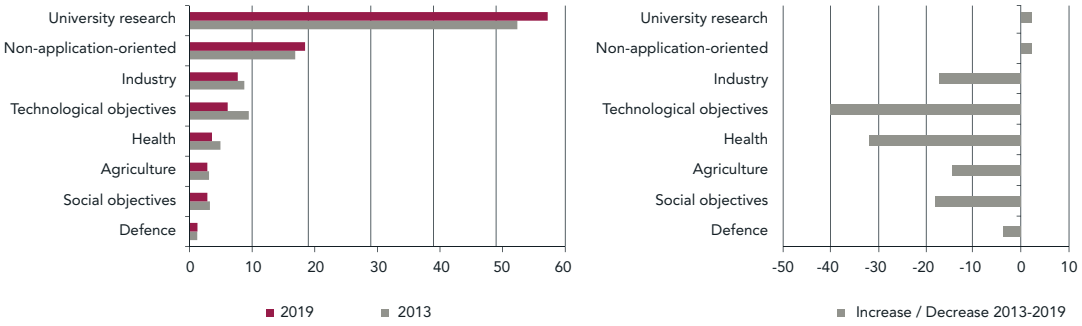
Goals of direct government expenditure on R&D

Government budgets can also be classified according to the goals the government wants to achieve by making research budgets available.[27] Research at universities (the general university funds) and other non-application-oriented research dominate this picture. As shown in Figure 6, funding for both of these goals will increase between 2013 and 2019, while that for other goals will decline. This means that the combined funding for other non-application-oriented research and the general university funds will increase from 69 per cent to 76 per cent between 2013 and 2019. The share for other goals will decline (except for Defence, which will remain the same).

26 If the OCW budget is adjusted for these general university funds, the project funding percentage rises from 20 per cent to 57 per cent.

27 For this NABS classification, see: http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NABS_207&StrLanguageCode=EN&IntPcKey=&StrLayoutCode=HIERARCHIC.

Figure 6 Government R&D expenditure by goal: a) in percentages of the total and b) in percentages of increase / decrease between 2013 and 2019



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Source: Rathenau Instituut database

9 Innovation expenditure, by ministry

As indicated in Section 3, one of the aims of this Facts & Figures publication is to analyse government expenditure on innovation. This expenditure can be classified in three categories:

a) R&D expenditure that is also innovation-relevant;
b) expenditure aimed at innovation, but without an R&D component;
c) tax incentives for R&D and innovation.

Table 6 itemises this expenditure by ministry and as a percentage of the total direct and indirect financial support for R&D and innovation.

Table 6 Innovation and innovation-relevant R&D expenditure by government, in millions of euros, 2013-2019

	2013	2014	2015	2016	2017	2018	2019
Innovation-relevant R&D expenditure, by							
Ministry of Security and Justice	8.2	8.0	7.8	7.5	7.2	7.1	7.1
Ministry of Education, Culture and Science	169.0	229.0	294.0	294.0	294.0	294.0	294.0
Ministry of Defence	59.2	62.8	58.4	57.2	57.0	57.0	57.0
Ministry of Infrastructure and the Environment	5.7	7.0	6.6	6.6	6.6	6.6	6.6
Ministry of Economic Affairs	791.0	909.6	767.4	664.0	640.7	616.3	607.3
Ministry of Health, Welfare and Sport	49.8	43.5	42.4	42.6	37.7	36.3	35.6
Total innovation-relevant R&D expenditure	**1,082.9**	**1,259.8**	**1,176.6**	**1,072.0**	**1,043.2**	**1,017.3**	**1,007.5**
Expenditure on non-R&D innovation							
Ministry of the Interior and Kingdom Relations	9.5	10.2	1.0	0.0	0.0	0.0	0.0
Ministry of Infrastructure and the Environment	2.1	5.0	4.2	6.8	1.0	0.0	0.0
Ministry of Economic Affairs	151.3	167.5	129.1	106.8	101.4	98.0	88.3
Ministry of Health, Welfare and Sport	2.8	2.4	2.6	0.7	0.7	0.7	0.7
Total expenditure on non-R&D innovation	**165.8**	**185.2**	**136.9**	**114.2**	**103.1**	**98.7**	**89.0**
Tax incentives for R&D and innovation	**1,003.1**	**1,068.6**	**1,042.6**	**945.7**	**930.6**	**930.6**	**930.6**
Total support for innovation	**2,251.7**	**2,513.6**	**2,356.2**	**2,131.9**	**2,076.8**	**2,046.6**	**2,027.1**
As a percentage of overall support for R&D and innovation	37.8	40.7	39.5	37.5	37.2	37.1	36.8

Expenditure on innovation accounted for 38 per cent of the total of all R&D and innovation expenditure in 2013, rising to nearly 41 per cent in 2014, and then dropping to 37 per cent in 2019. Given how short the history of collecting these figures is, they should be interpreted cautiously. More time and experience will be required in order to make adequate estimates.

Box 2: Comparing the TWIN figures on innovation with those of the Netherlands Court of Audit

In 2013-2014, the Netherlands Court of Audit [*Algemene Rekenkamer*] ('AR') took stock of the ministries' expenditure on innovation. In contrast to the survey underlying the TWIN report, the AR did not provide a definition of 'innovation', but allowed the ministries the leeway to define innovation expenditure for themselves.[28] The AR report indicated that there was a significant difference between its figures and those in the TWIN report for 2012-2018 (EUR 3.2 billion versus EUR 2.1 billion, respectively). In addition, the AR indicated that the term 'innovation' was not used consistently.

The two reports are difficult to compare because of their different aggregation levels and because the AR report does not publish specific amounts for each policy item. Nevertheless, several observations can be made:

- This TWIN report for 2013-2019 states a total expenditure on innovation of some EUR 400 million per year, higher than the figure presented in the TWIN report for 2012-2018. The difference is due not only to a better estimate of EZ expenditure on innovation, but also to the inclusion in the OCW budget of the funds committed by NWO and the KNAW (Royal Netherlands Academy of Arts and Sciences).
- The difference between the AR report and the TWIN report for 2012-2018 is most pronounced in respect of VWS. This difference is attributable to the fact that the AR report includes part of the health care budget framework, which is excluded from the TWIN figures (with the single minor exception being the allowance for the availability of university-level care). This is because only a small portion of the health care budget framework is paid from the VWS budget (the largest part is financed with contributions from health insurance) and the TWIN figures are generally based on the VWS budget. According to the AR report, the health care budget framework is good for half a billion euros.

The Rathenau Instituut views the collection of data on innovation expenditure, which is part of the total survey of R&D and innovation expenditure, as a growth model. More experience is gained each year in delimiting and reviewing the budget. Thorough consultations with the ministries have already produced improved results in this TWIN report, and our intention is to continue along this route.

10 Small Business Innovation Research (SBIR)

In section 8, we saw that only a portion of government budgets is utilised for specific goals. One specific tool that has been used for several years at the interface between research and innovation is the SBIR (Small Business Innovation Research) scheme. The SBIR scheme is not particularly vast, but it is a good example of an incentive for innovation-relevant research. With this scheme, the government challenges entrepreneurs to develop products that will help solve social problems. There are three different SBIR schemes:[29]

28 The report can be found at http://verantwoordingsonderzoek.rekenkamer.nl/node/21389 (in Dutch only).

29 http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2010/03/04/eerste-evaluatie-small-business-innovation-research-sbir-programma-s-in-nederland.html (in Dutch only).

a) a ministerial SBIR aimed at solving social problems and reinforcing innovativeness in the SME sector;
b) the STW Valorisation Grant,[30] aimed at academic innovative start-ups;
c) the TNO-SBIR programme, which is aimed at the entrepreneurial development of TNO's ideas for innovative products.

In 2010, Technopolis assessed these three SBIR schemes in the Netherlands,[31] reaching the general conclusion that all three generally work well. The participants were largely satisfied with the schemes' structure and implementation. The contracting ministries were also generally satisfied with the implementation of their SBIR calls. Another conclusion drawn from the assessment, however, was that it was still too early to comment on the cost-effectiveness of the SBIR variants because the effects and impact of SBIR are not yet clear. The ministries are satisfied with how efficiently the ministerial SBIR variant is being implemented. Thanks to SBIR, the ministries are receiving multiple innovative solutions that contribute to the resolution of social problems, and they are receiving them relatively quickly.

The core of the ministerial SBIR is a ministry's tender of an R&D project which is intended to result in competition between companies. Interested parties must submit their bids to RVO.nl, and the offers for each SBIR project are assessed by a committee that examines:

a) its impact on a social problem, entrepreneurship, innovation, economic perspective, and ecological and social issues;
b) the quality of the bid and the project.

The ministerial SBIR scheme comprises three phases, with the government funding the first two:

– Phase 1: feasibility study of the innovation. Based on the assessment of the project proposals received, the relevant ministry takes a decision on contracting for the best proposals. This results in the performance of a feasibility study (maximum of six months, maximum of EUR 50,000 per project).
– Phase 2: development of the innovation. In this phase, the feasibility study conducted in the first phase is assessed based on the same assessment criteria, but also taking into account the economic prospects for the third phase. The assessment committee issues an opinion and the relevant ministry then takes a decision on executing the projects that must result in the development of the innovation. The companies start R&D (maximum of two years, maximum of EUR 450,000 per project). The final result may be a tested prototype, a demonstration, or a product, process, or service trial.
– Phase 3: marketing of the innovation. In Phase 3, the companies ready their product for the market. Although the government does not fund it, this phase offers the government a good opportunity to take a strong position as a contracting public authority procuring innovation (an 'innovation-specific contractor') and to be the first to procure the new products resulting from the SBIR project.

In 2015, funding has been budgeted for fourteen SBIR programmes in such fields as natural gas, cyber security, livestock breeding, and security. These programmes were started between 2012 and 2014. In total, a multiyear budget of more than EUR 7.3 million has been earmarked for SBIR programmes, EUR 6.6 million of which comes from EZ's budget. In addition, EUR 700,000 of VenJ's budget has been earmarked for a project designed to develop security against unmanned aerial vehicles (drones).

30 This has existed since 2004, and has been included since 2014 in the new STW Take-off programme for the 2014-2018 period. This programme is part of EZ's Early Phase Financing [Vroege Fase Financiering] programme. Between 2004 and 2011, STW used EUR 19 million for the Valorisation Grant.
31 See footnote 29.

11 Innovation procurement

Innovation procurement, referred to in the previous TWIN as 'innovation-specific contracting', refers to the government's role in funding innovation. In this role, the government acts as a 'lead customer' that spends money in order to use innovation and the innovative capacity of industry to solve the problems facing society. At the same time, government wants to encourage the domestic market for innovative businesses. When a government acts as a lead customer, it can play a key role in initiating innovation in those areas in which it dominates the demand side of the market. The government has developed a programme for this purpose with projects covering eight areas of society that require attention.

Innovation procurement occurs when a government specifically looks for an innovative solution or gives commercial parties scope to develop and furnish an innovative solution. Governments ask for innovations in order to solve social issues, for example in the area of sustainability. 'Specific' can be viewed in two different ways:

1. The contracting authority is looking specifically for innovative solutions as part of its purchasing policy.
2. The contracting authority's purchasing strategy does not explicitly involve a search for innovation, but it is seeking an innovative solution within the context of a specific procurement procedure.

The government has been monitoring innovation procurement since 2010. Random checks are conducted in respect of all relevant tenders, after which a survey is performed at the relevant contracting authorities. Of the tenders randomly checked in 2012, 70 per cent originated from VenJ, Defence, EZ, and Rijkswaterstaat (Directorate General for Public Works and Water Management).

Table 7 classifies the tenders that were checked and indicates the percentage of tenders that qualified as a certain type.

Table 7 Tender characteristics

	2011	2012
% seeking an innovative solution	3.8% – 9.1%	4.5% – 6.6%
% tenders for innovation procurement	2.5% – 6.0%	3.6% – 5.2%
% led to an innovative solution	2.2% – 5.3%	2.7% – 3.9%
Selected tenders	195 (of the 629)	177 (of the 553)
Responses	82 (=42%)	122 (=69%)

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Source: DACCLE Monitoring Report

Note: The figures in the table represent a range. The minimum threshold indicated in the table is based on the responses. The maximum threshold was extrapolated based on the non-responses. In comparison to 2011, the minimum thresholds rose and the maximum thresholds fell in 2012. This is attributable to the increase in the response rate from 42% to 69%. The results for 2012 thus provide a narrower range between the minimum and maximum thresholds.

Tenders for innovation procurement have been undertaken in soil management, road building and marine engineering, transport, packaging, insurance, computerisation/telecommunications, consulting and flexible work practices, commercialisation, and building and systems management. It is impossible, based on this survey, to estimate the amount of expenditure that relates to innovation procurement.

The University of Twente conducted a specific study of innovation procurement at the Rijkswaterstaat.[32] The goal of the study was to develop a quantitative assessment tool that could ascertain how much of the total procurement budget (excluding the items 'information supply' and 'operations') is used for innovation procurement. Innovation procurement is defined as:

a) the public procurement of innovative solutions;
b) pre-commercial procurement that involves 'specifically seeking an innovative solution or affording market parties the leeway to develop or offer an innovative solution'.[33]

It proved to be difficult to assess whether the contracts actually result in innovations, and this element was ultimately excluded from the assessment tool. The tool that was developed was tested on the two elements of innovation procurement. The application of the assessment tool for 2012 led to 7.6 per cent of the procurement budget assessed being qualified as having been used for innovation procurement.

12 European funding of R&D in the Netherlands

In addition to the funding provided by the Dutch government, public funds are also made available annually from abroad, particularly from the European Union. This section examines the funding made available through the European Framework Programmes. Section 13 discusses European funding at regional level.

The European Union uses the Framework Programmes to stimulate research and innovation, with the ultimate goal of creating a European Research Area ('ERA'). The goal of the ERA is to strengthen European research achievements and to stimulate growth and job creation. Up to now, there have been seven Framework Programmes. The eighth Framework Programme, called 'Horizon 2020', was recently started with a total budget of EUR 80 billion and will run from 2014 until 2020. The Netherlands has always been successful in obtaining subsidies from this European funding source. The Netherlands obtained 7.4 per cent, nearly EUR 3.4 billion, in funding from the seventh Framework Programme (FP7). If this percentage is compared to the Netherlands' contribution of 5 per cent of the Framework Programme budget, then its return on that investment equalled one and a half times its contribution.[34] The income to the Netherlands has increased along with the budgets for the successive Framework Programmes. If we extrapolate the income figures from FP7 to Horizon 2020, then the Netherlands could receive nearly EUR 6 billion. Dividing that over the programme timetable, that amounts to nearly EUR 800 million per year (compared to EUR 475 million for FP7).

The FP7 funds were allocated in the Netherlands as follows: 51 per cent to institutions for higher education; 21 per cent to research institutes; 22 per cent to industry; and 6 per cent to 'other'.

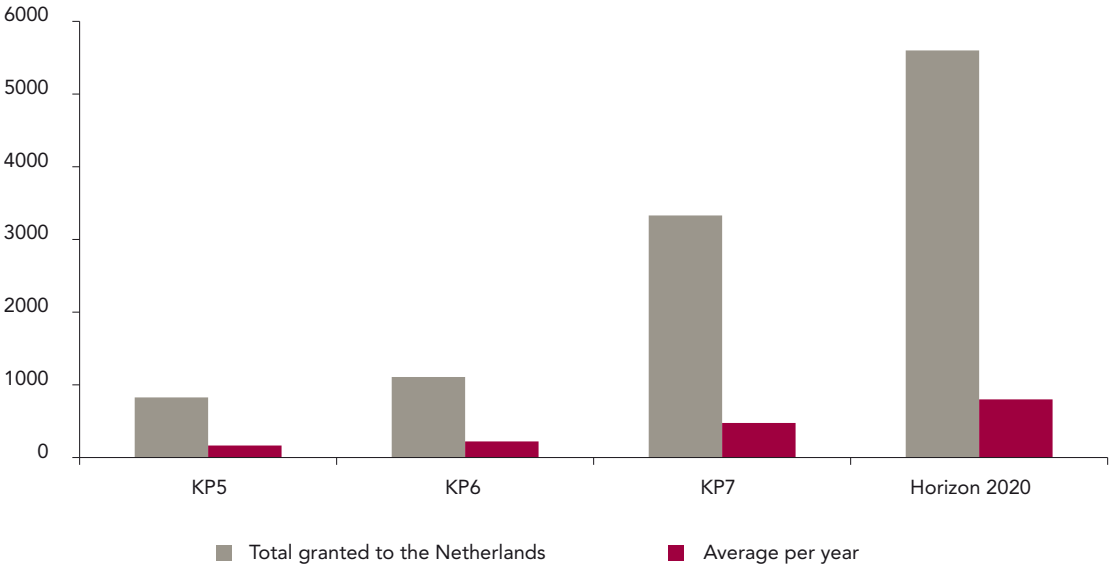
Figure 7 illustrates the income received from the various Framework Programmes and provides a conservative estimate of the income from Horizon 2020.

32 Lenderink, B. (2015), *Development of a Measurement Instrument for Innovation Facilitating Procurement*. Enschede: University of Twente. Master Thesis (http://essay.utwente.nl/66578/).

33 Source, see footnote 32.

34 For a review of Dutch participation in FP7, see the letter of the State Secretary of OCW to the House of Representatives: http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2014/06/19/kamerbrief-over-nederlandse-deelname-aan-zevende-kaderprogramma-voor-onderzoek-en-technologische-ontwikkeling-kp7.html (in Dutch only).

Figure 7 Dutch researchers' income from European Framework Programmes, received and estimated, in millions of euros



Source: RVO.nl

Note: The figures for Horizon 2020 are estimates, the return percentage is estimated at 7 per cent.

13 Innovation-related activities at regional level

The interest in the regional aspects of innovation is growing,[35] since funding for knowledge development and innovation is available not just at national level, but at regional level as well. A study performed by Bodewes Beleidsadvies for the Rathenau Instituut[36] revealed a complex landscape of regional investments in knowledge development and innovation. This is attributable to various factors:

- the complexity of the funding streams, with funding and co-funding originating from a variety of sources (international, national, regional, and local);[37]
- the provinces' delegation of scheme implementation to other organisations;
- differences in the regional parties' reports;
- the interrelationship between knowledge and innovation activities and other activities.

The study estimates that up to EUR 100 million was expended on knowledge and innovation at regional level in 2014, but that that amount will increase sharply in the coming years. The most important reason for this is because early 2014 marked the beginning of a new period of European funding for 2014-2020, as a result of which new programmes did not start until late 2014/early 2015.

Regional activities are funded by various sources, which are explained below.

35 In 2014, for example, the Science, Technology, and Innovation Advisory Council [*Adviesraad voor Wetenschap, Technologie en Innovatie*] issued a report on regional hotspots: http://www.awti.nl/publicaties/regionale-hotspots/item716 (in Dutch only)

36 Bodewes Beleidsadvies, Regionale activiteiten en investeringen gericht op R&D en innovatie ['Regional activities and investments aimed at R&D and innovation'], November 2014. The study can be accessed at http://www.rathenau.nl/fileadmin/user_upload/rathenau/Publicaties/Science_System_Assessment/2015/Inventarisatie_regionale_investeringen_-_Rathenau_Instituut.pdf (in Dutch only).

37 There is virtually no overlap between the regional figures and the figures in the other tables. The financing from the EU at regional level is not provided through the Framework Programmes, but through another programme. Only the TWIN figures on R&D expenditure by the ministries (EZ) include figures on the co-funding from the ERDF (European Regional Development Fund).

European funds

The European Union (EU) has various funds for strengthening regions, the most important of which is the European Regional Development Fund (ERDF). The ERDF funds four regional programmes and eight so-called 'Interreg' programmes in the Netherlands. These programmes are permitted to focus on four priority areas:

1. innovation and research,
2. the digital agenda,
3. support for SMEs,
4. the low-carbon economy.

The EU conditions its funding for regional programmes on obtaining at least 50 per cent in co-funding (from public and/or private sources). EZ's budget reserves funds for national co-funding. Each of the four regions in the Netherlands (North, East, South, and West) has a Management Authority (MA) to implement and manage the programmes. Most of the programmes in this context focus on 1) knowledge and innovation, and 2) research and innovation aimed at low-carbon technologies.

Table 8 Regional programmes

	North	East	South	West
Provinces involved	Groningen, Friesland, Drenthe	Overijssel, Gelderland	Brabant, Zeeland, Limburg	Noord-Holland, Zuid-Holland, Flevoland, Utrecht
Management Authority	SNN	Province of Gelderland	Province of Noord-Brabant, implemented by Stimulus	Municipality of Rotterdam
Programme	Strategy for the North	GO	OP-Zuid	Opportunities for the West
Funds for knowledge and innovation (2014-2020)	EUR 99.4 million (excl. EUR 18.5 million in co-funding from EZ)	EUR 96.3 million (excl. EUR 18 million in co-funding from EZ)	EUR 109.1 million (excl. EUR 20 million in co-funding from EZ)	EUR 117.3 million (excl. EUR 33 million in co-funding from EZ)

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Source: Bodewes Beleidadvies

The plans show that approximately EUR 60 million (exclusive of EZ co-funding; nearly EUR 75 million inclusive of EZ co-funding) will be used each year for knowledge and innovation. This amount could be higher if co-funding is provided by industry, provincial governments, and/or municipal governments. The tools by which the funding will be provided still have to be worked out, but these will likely include vouchers, cluster programmes, partnerships, and schemes for knowledge workers.

The Interreg programmes can be classified according to:

a) cross-border cooperation,
b) transnational cooperation,
c) interregional programmes.

Exactly what amount in funding will be made available to the Netherlands in the 2014-2020 period remains uncertain, but a conservative estimate in the Bodewes Beleidsadvies study estimates it at more than EUR 30 million per year, exclusive of co-financing to be provided by EZ and I&M. Through the Interreg programmes, the Netherlands focuses on working in partnerships with Flanders, Germany, the Meuse-Rhine Euroregion, the North Sea region, northwestern Europe, European regional development, and sustainable urban development.

The total in European funds (ERDF) going forward from 2015 will be between EUR 90 million and EUR 100 million per year, exclusive of co-funding (and EUR 200 million to EUR 300 million inclusive of co-funding by the Dutch national government, regions, and industry). Because the programmes commenced in 2014, it is not to be expected that much expenditure was made in 2014, and that expenditure will only get underway in 2015.

Provincial funds

Dutch provinces also finance knowledge and innovation activities, usually as part of their provincial economic policies, which lay down specific priorities. Provincial funding is also largely concentrated on the SME sector. In addition to funding provincial schemes, the provinces also fund regional development companies, co-fund ERDF programmes and national and municipal programmes, as well as ad hoc initiatives. There are significant differences between the amounts the provinces set aside in their budgets for knowledge and innovation, with amounts ranging from a few million euros to EUR 30 million in the Province of Groningen. This relates to the sale of energy companies (NUON and Essent) in which various provinces held shares. Most of the proceeds have been invested in revolving innovation funds to be managed by the regional development companies.

Table 9 The provinces and their knowledge and innovation activities

Province	Focus areas	Annual budget (millions of euros) *	Organisation involved	Cluster activities
Groningen	• Energy • Life Sciences / Healthy Ageing • Biobased Economy / Agribusiness	30	**Investerings- en Ontwikkelingsmaatschappij voor Noord-Nederland (NOM)** SNN Economic Board Groningen	Energy Valley Healthy Ageing Network Noord-NL (HANNN) Technologie Centrum Noord-NL (TCNN)
Friesland	• Water technology • Agrofood • Health care economy	4 – 15	NOM SNN	Water Alliance Dairy Campus Innexus CIW/CIF HANNN TCNN
Drenthe	• Sensor technology • Agribusiness / biobased economy / energy • Leisure economy	3	NOM SNN	Sensor Universe HANN TCNN
Utrecht	• Creative industry • Life Sciences • Sustainable economy	2.5	Economic Board Utrecht Taskforce Innovatie Regio Utrecht	Utrecht Science Park Dutch Game Garden
Noord-Nederland	Strengthening innovative clusters: • Greenport Aalsmeer • Offshore industry • Agribusiness • Financial business services • Logistics	2 to 3	**Ontwikkelingsbedrijf Noord-Holland Noord (NHN)** Gemeente Amsterdam Amsterdam Economic Board Metropool Regio Amsterdam	Greenport Aalsmeer en NHN Seed Valley Enkhuizen
Zuid-Holland	• Maritime and delta technology • Biobased economy • Transport and logistics	5	**Innovation Quarter** Zuidvleugel	Medical Delta Security Delta Maritieme Delta Greenport Campus Biotech Campus Delft
Flevoland	• Agrofood & horticulture, agriculture, and fish • HTSM: composites • LSH: human and animal health and health care innovation	1.5 - 2	**Ontwikkelings Maatschappij Flevoland (OMFL)** Kansen voor Flevoland Economic Development Board Almere	Campoworld

Province	Focus areas	Annual budget (millions of euros) *	Organisation involved	Cluster activities
Overijssel	• HTSM • Health / Life Sciences • Plastics / chemicals • New energy Regional top sectors: • Agro & food • Construction • Tourism	Long-term: 2 Current coalition period ± 20	**Oost NV** Wadinko NV Regionale innovatieloketten: Stedendriehoek Innoveert Kennispoort Zwolle Kennispark Twente	Open Innovatiecentra Overijssel Kennispark UT
Gelderland	• Health • Food • Manufacturing • Energy and environmental technology (EMT) Emerging: fashion (creative industry)	24 of which: 1 for innovation in agriculture and horticulture and 6 for EMT	**Oost NV** Zeven Regionale Centra voor Technologie	Food Valley Health Valley Greenport Gelderland GreenTechAlliances Platform Creatieve Technologie
Noord-Brabant	• Food & nutrition • Life Sciences & Medical technology • Maintenance • Logistics • High-Tech Manufacturing • Biobased economy	10-12	**Brabantse Ontwikkelings Maatschappij (BOM)** **Brainport Development Rewin** Stichting Brainport Regio West-Brabant Midpoint Brabant Samenwerkingsverband Regio Eindhoven BrabantStad	Solliance Agrifood Capital Brainport Industries Automotive NL Maintenance Valley Gate 2
Limburg	Top sectors: • Chemicals and materials • Life Sciences • Agrofood	1.5 for strengthening regional top sectors, plus an unspecified amount and exclusive of funds for campuses	**NV Industriebank LIOF** Brainport 2020 Limburg Economic Development Keyport Greenport Venlo	Chemelot Campus Maastricht Health Campus Greenport Valley Smart Services Campus
Zeeland	• Ports & industry: biobased economy, maintenance and logistics • Energy • Health care • Leisure economy • Water • Agrofood / agriculture • Seafood / fishing	2 - 3	**IMPULS** Strategic Board Delta Region	

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Source: Bodewes Beleidadvies

Note: The organisations in bold print are development companies.

* The amounts in the table generally refer to long-term provincial funding for knowledge and innovation and are based on the 2014 provincial budgets. Because it is not clear in every case whether the amounts in the budget including monies for co-funding, the figures should be interpreted cautiously. The funding for the regional development companies may also be included in the budgets.

Regional development companies (RDCs)

The shareholders in the four RDCs – referred to in Table 9 as NOM, Oost NV, BOM, and LIOF – are EZ and the provinces. The RDCs focus on promoting investment, business development, equity investment, and developing industrial estates. The RDCs manage various 'innovation funds', most of which were started with the proceeds from the sale of the energy companies. The instruments vary from subsidies to loans, and from investments to shareholdings.

Table 10 The Regional Development Companies and their knowledge and innovation activities*

	NOM	Oost NV	BOM	LIOF
Provinces involved	Friesland, Groningen, Drenthe	Overijsel, Gelderland	Brabant	Limburg
Scope of activities Business Development 2013	EUR 24 million	EUR 30.9 million**	EUR 45 million	EUR 22.5 million**, of which EUR 7.1 million is a subsidy
Priority clusters	National top sectors: • Water • Agrofood • Horticulture • High-tech systems • Life Sciences • Chemical • Energy • Logistics • Creative industry	• Agrofood • Life Sciences • High-tech	• Maintenance • High-tech Systems • Logistics • Life Sciences & Health • Biobased Economy & New Energy • Agrofood • Electrically powered vehicles	• Logistics • Manufacturing • Agro and food - Venlo • Materials Chemelot • Health care – Maastricht

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Source: Bodewes Beleidadvies

* It is unclear how much of the amounts listed in this table are already included in the provincial amounts (see Table 9).
** This figure represents the entire scope of the project. The investment from the relevant RDC is smaller.

Recent years have seen the emergence of new development companies and comparable organisations aimed at strengthening the regional economy and competitiveness, including through innovation in priority sectors. Several of these new organisations are listed in Table 9: Impuls in Zeeland, OMFL in Flevoland, Innovation Quarter in Zuid-Holland, Brainport Development and REWIN in Brabant, and Ontwikkelingsbedrijf Noord-Holland-Noord. Most of these organisations have limited funds, with the exception of Brainport Development.

Other regional organisations

In this complex regional landscape, organisations with a 'triple-helix structure' have been created, which involve partnerships between local governments, education and research institutes, and industry. They have wide-ranging goals, activities, and budgets. Some implement schemes, while others are geared more towards marketing or providing support for regional project development. A few examples are the Economic Boards of Amsterdam and Utrecht, Kennispark Twente, Greenport Venlo, and Midpoint Brabant.

Box 3: Information about regional innovation at international level

A region's performance in the field of innovation is also emphasised within the EU by the publication of a scoreboard at regional level. The methodology for this scoreboard is the same as that for the annual **EU Innovation Union Scoreboard** that focuses on the countries as a whole, although only 11 of the latter scoreboard's 25 indicators can be used due to the lack of data at regional level.

The sixth edition of this regional scoreboard, containing data on 190 European regions, was published in 2014.[38] As does the Innovation Union Scoreboard, the report distinguishes four innovation performance groups: innovation leaders, innovation followers, moderate innovators,

38 http://ec.europa.eu/enterprise/policies/innovation/files/ris/ris-2014_en.pdf

and modest innovators. Of the twelve Dutch provinces, the two provinces of Utrecht and Noord-Brabant are classified as innovation leaders, with the remaining ten classified as innovation followers.

The EU also publishes a **Regional Innovation Monitor Plus** (RIM Plus),[39] which offers information about the regional innovation policies of twenty EU Member States and more than two hundred regions.

14 Concluding comments

The situation outlined in this TWIN report for 2013-2019 did not come out of the blue. The government agreements of 2010 and 2012, which laid the foundation for this situation, were intended to spark a trend away from direct funding for R&D towards one of fiscal support ('from specific to generic'). Part of this involves the phasing out of FES funding for R&D projects, cutting subsidies (some of which were linked to R&D projects), and replacing part of the direct funding for R&D projects by strengthening tax incentives. This course was fleshed out by industrial and top sector policies. The effect of this policy reversal has also been noted in previous reports on government budgets for R&D (and innovation). If we examine direct expenditure on R&D in proportion to the total amount of direct and indirect support provided, however, we see that that proportion will remain relatively stable at 83 per cent in the 2013-2019 period, though it did decrease in the 2008-2014 period from 91 per cent to 82 per cent.

The consequence of the policy that was launched several years ago, is that direct government expenditure on R&D will drop from EUR 4.8 billion to EUR 4.5 billion in the 2013-2019 period. Several intensifications based on the government agreement of 2012 and agreements regarding the 2014 budget have raised R&D expenditure to a higher level (by approximately 10 per cent) than stated in the previous TWIN report, but that has only a minor effect on the decrease. OCW is the only ministry whose expenditure has increased (apart from SZW, whose R&D budget is so small that the increase does not merit consideration here). The increase is partly the consequence of intensifying the primary funding to NWO, which is intended, among other things, to be used for matching and co-funding European programmes, and partly the consequence of an increase in the estimated general university funds for R&D. As a result, OCW's share in direct expenditure on R&D will increase in the coming years, from 70 per cent in 2013 to 76 per cent in 2019.

Because the GDP was adjusted upwards in 2014, however, the increase in the amount of direct expenditure will not result in an increase in its percentage of the GDP, but only maintain the percentages as stated in the previous TWIN report. As shown in previous reports, R&D expenditures are decreasing at the ministries, particularly BZ, I&M, EZ, and VWS (a downward trend was already underway at Defence).

Indirect government expenditure on R&D (WBSO and the RDA introduced in 2012) show a sharp increase from EUR 0.4 billion in 2008 to EUR 0.7 billion in 2009, and this increase will continue through 2014 until reaching a maximum of EUR 1.1 billion in 2015, decreasing thereafter to EUR 0.9 billion. The combination of direct and indirect R&D expenditure also shows an increase between 2008 and 2009 that can be attributed in part to temporary crisis measures, peaking between 2009 and 2014, and then decreasing thereafter.

Because the methods for compiling innovation figures are still being developed, those figures should be interpreted cautiously. We hope to work with the ministries in the coming years to get a better picture of their innovation budgets. Given this, there is possibility that these budgets will prove to be higher.

39 http://ec.europa.eu/enterprise/policies/innovation/policy/regional-innovation/monitor/

Appendix 1: Definitions

Some of the terms used in the TWIN report cannot be precisely defined or delineated. Because they sometimes overlap with one another or are sometimes used interchangeably, this Appendix includes an explanation of the most important terms: Research and Development (R&D), (scientific) research, science, and innovation. The authors of the TWIN report have made their best efforts to adhere to the terminology used at Statistics Netherlands, which is derived from a manual published by the OECD: the Frascati Manual. The most recent version of the manual dates from 2002.

In the Frascati Manual, **R&D** is an umbrella term for three types of activities:

- Basic research. This consists of experimental or theoretical work undertaken primarily to acquire new knowledge, without any particular application or use in view.
- Applied research. This is also original investigation undertaken to acquire new knowledge, but directed primarily towards a specific practical aim or objective.
- Experimental development. This is systematic work, drawing on existing knowledge gained from research or practical experience, which is directed towards producing new materials, products or devices or towards improving those already produced.

Science encompasses objective human *knowledge* that has been systematically acquired (through scientific research) and organised, the *process* of knowledge acquisition, and the *community* in which this knowledge is acquired. That scientific community has its own set of principles, methods and conventions on which it bases its research.[40]

Scientific research consists of the activities of the scientific community and is mainly associated with basic research. Basic research is generally conducted within institutions for higher education and non-academic institutions, as well as, to a lesser degree, research institutes and commercial enterprises. Universities also carry out applied research and experimental development, albeit to a lesser extent.

Innovation consists of activities that lead to new or vastly improved products, processes and services, or to administrative, organisational innovation within organisations or broader social alliances. R&D can be a part of innovative activities and is thus labelled as being innovation-relevant. Examples of innovative activities that cannot be classified as R&D include the purchasing of products (e.g. software or equipment) or external expertise and activities such as industrial design. Innovation can thus be based on R&D activities but it can also take other forms. Statistics Netherlands uses R&D as one of the categories for charting innovation in the private sector.

All things considered, it is not always possible or simple to draw a strict distinction between R&D and innovation. Whether an R&D activity can be called innovation-relevant depends in part on the purpose of the activity.

40 See: http://nl.wikipedia.org/wiki/Wetenschap (in Dutch only).

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1	Steen, J. van (September 2008) *Facts and Figures: Universities in the Netherlands*. The Hague: Rathenau Instituut.
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9	Drooge, L. van, S. de Jong, M. Faber & Don D. Westerheijden (May 2013) *Twenty years of research evaluation (with appendix)*. The Hague: Rathenau Instituut.
10	Horlings, E., T. Gurney, J. Deuten & L. van Drooge (November 2013) *Patents held by knowledge institutes*. The Hague: Rathenau Instituut (in Dutch only).
11	Steen, J. van (March 2014) *Total Investment in Research and Innovation (TWIN) 2012-2018*. The Hague: Rathenau Institute.
12	Chiong Meza, C., J. van Steen & J. de Jonge (August 2014) *Facts and Figures: University hospitals in the Netherlands*. The Hague: Rathenau Instituut.
13	Goede, M. de & L. Hessels (November 2014) *Researcher motivation*. The Hague: Rathenau Instituut (in Dutch only).

About this publication

This is the fourteenth publication in the Science System Assessment Facts and Figures series. This edition surveys the Dutch national government's expenditure on R&D and innovation in the 2013-2019 period. The data were collected from the various ministries and are based on their 2015 budgets.

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