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**An analysis of the state of research and development  
co-operation between Greece and Germany**

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### Introductory note

In what follows, an analysis of the Research and Development (R&D) cooperation between Greece and Germany is presented. To accomplish such a feat in a comprehensive manner, the availability and up-to-date character of the relevant data needed to be taken into consideration.

Given the prime networking effect of European R&D competitive funds, in addition to them being a main funding source for the Greek science and technology base weighted towards encompassing an analysis of the 7<sup>th</sup> Framework Programme.

Examining the scientific 'output' in terms of publications, and more specifically of co-publications by Greek and German authors in acclaimed science and technology journals stands as the second pillar of this analysis.

Lastly, the bilateral R&D program, given its explicit and direct aim towards enhancing the R&D cooperation between the two countries is also included.

## 1. 7<sup>th</sup> FRAMEWORK PROGRAMME 2007-2013<sup>1</sup>

As the following table (1) indicates, the absolute number of FP7 projects populated by at least one German and one Greek legal entity is 1.498. In the Greek case, this amounts more than 50% (60,5%) of the total Greek participation in the FP, standing as a significant indicator of the bilateral research collaboration. In matters of net value creation, Greek participants managed to attract EU funds amounting to more than 600 million €, whereas German ones almost 1.3 billion €. Coordination (of the projects) from the legal entities from both countries amounted to 10% of the total participating populations. Overall, the total number of collaborative links created between Greece and Germany in the 7th FP amounted to 5.627.

No of projects with DE–GR participation	1.498
% in total GR projects	60,5%
Total EC funding for GR participants (million Euros)	618,12
Total EC funding for DE participants (million Euros)	1.255,54
No of GR participations	2.280
<i>Of which GR as coordinators</i>	225
No of DE participations	3.563
<i>Of which DE as coordinators</i>	301
No of collaborative links <sup>2</sup>	5.627

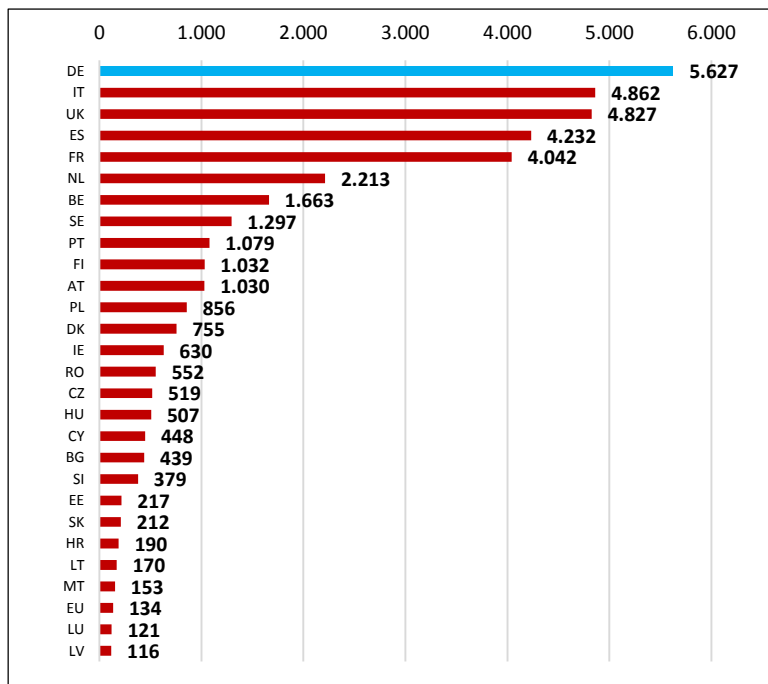
<sup>1</sup> Data were extracted from ecorda database (European Commission): 30.10.2015.

<sup>2</sup> A collaborative link is assumed to exist between each pair of participants in each project / contract. The number of collaborative links created by a project is calculated in the following way: When there are m participants from one country and p from another country in a project, the number of collaborative links created between the two countries as a result of the project is assumed to be m\*p.

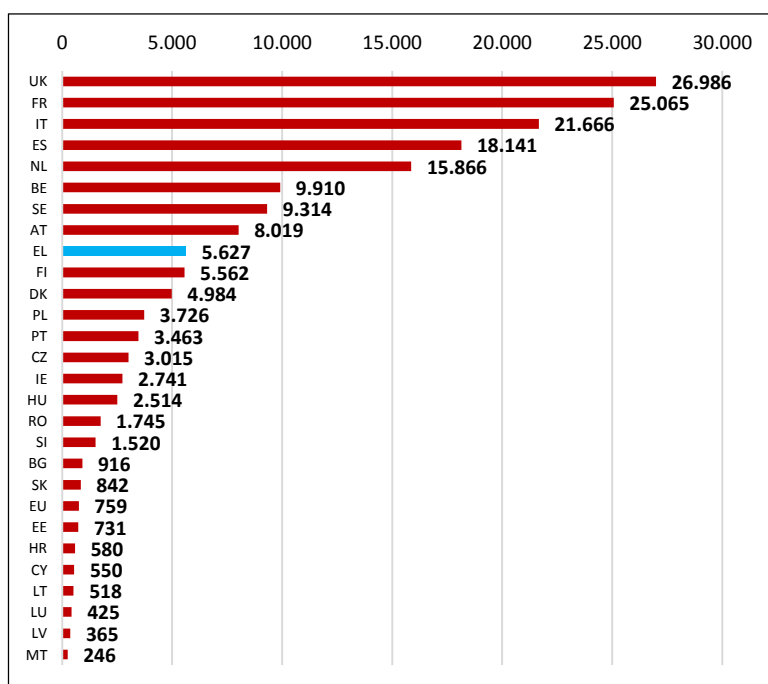
Performing a basic network analysis on the basis of the number of collaborative links, both the quality and quantity of the research partnership of the legal entities of both countries becomes evident. As the following graphs (1) indicate, German entities are the prime international entities with which Greek entities have established the highest number of collaborative links (1.a.), whereas Greek entities outperform traditional German partners, such as Danish and Finnish ones, in establishing collaborative links with their German counterparts (1.b.).

**The importance of cooperation for both countries, Graph 1.**

1.a. Collaborative links of EU28 countries with Greece, 2007-2013.



1.b. Collaborative links of EU28 countries with Germany, 2007-2013.



Analyzing the cooperating legal entities, in the following table (2), it appears that whereas Greek participations are evenly divided amongst Greek academic and research institutions, the bulk of German participations are positively attributed to a much smaller segment of legal entities, foremost of which is Fraunhofer institutes.

**Cooperating organizations, Table. 2**

**2.a. Top GR organizations:**

<b>GR PARTICIPANT</b>	<b>No of Participations</b>
FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS	156
CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS CERTH	153
NATIONAL TECHNICAL UNIVERSITY OF ATHENS - NTUA	124
INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	106
UNIVERSITY OF PATRAS	104
NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS	94
ARISTOTLE UNIVERSITY OF THESSALONIKI	92
NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS"	75
HELLENIC CENTRE FOR MARINE RESEARCH	45
ATHENA RESEARCH AND INNOVATION CENTER IN INFORMATION COMMUNICATION & KNOWLEDGE TECHNOLOGIES	35
NATIONAL HELLENIC RESEARCH FOUNDATION	30
ATHENS TECHNOLOGY CENTER SA	30

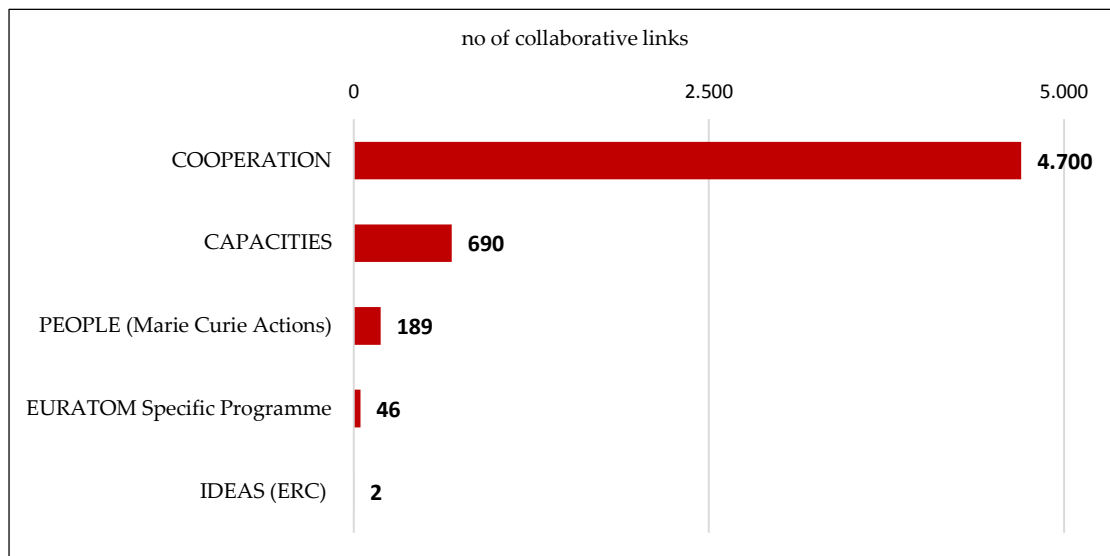
**2.b. Top DE organizations:**

<b>DE PARTICIPANT</b>	<b>No of Participations</b>
FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	275
DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	111
UNIVERSITAET STUTTGART	72
KARLSRUHER INSTITUT FUER TECHNOLOGIE	71
MAX PLANCK GESELLSCHAFT ZUR FOERDERUNG DER WISSENSCHAFTEN E.V.	52
RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN	50
TECHNISCHE UNIVERSITAET BERLIN	48
FORSCHUNGSZENTRUM JUELICH GMBH	44
TECHNISCHE UNIVERSITAET DRESDEN	43
TECHNISCHE UNIVERSITAET MUENCHEN	39
AIRBUS DEFENCE AND SPACE GMBH	38
UNIVERSITAET BREMEN	30

Performing an analysis of the collaborative linkages between the two countries per Programme of FP7, as the following graph (2) and tables (3) indicates out of 5.627 links more than 80% (4.700) of those can be found in the 'cooperation' programme. Zooming in into the programme, most of these links take place in the thematic areas of ICT, the NMP programme and Transport (incl. Aeronautics). Attention should be given to the nascent fields of security and space where a nurturing relation seems evident. Focusing on the 'capacities' programme, a programme accounting for 12% of the total collaborative links, the bulk of those links are attributed to the 'research infrastructure' and the 'research for the benefit of SMEs' programmes.

**Thematic areas of cooperation, Graph 2.**

Collaborative links between GR and DE per Programme, 2007-2013.



**3.a. Collaborative links between GR and DE in COOPERATION specific programmes, 2007-2013.**

<b>COOPERATION</b>	<b>No of Collaborative links</b>
Information and Communication Technologies Programme	1.968
Nanosciences, Nanotechnologies, Materials and new Production Technologies - NMP Programme	568
Transport (including Aeronautics) Programme	537
Environment (including Climate Change) Programme	337
Food, Agriculture and Fisheries, and Biotechnology Programme	286
Health	257
Energy Programme	216
Joint Technology Initiatives (Annex IV-SP1) Programme	193
Security Programme	160
Space Programme	129
Socio-economic sciences and Humanities Programme	45
General Activities	4
<b>COOPERATION -total</b>	<b>4.700</b>

**3.b. Collaborative links between GR and DE in CAPACITIES specific programmes, 2007-2013.**

<b>CAPACITIES</b>	<b>No of Collaborative links</b>
Research Infrastructures Programme	303
Research for the benefit of SMEs Programme	236
Science in Society Programme	85
Activities of International Cooperation Programme	42
Regions of Knowledge Programme	21
Research Potential Programme	3
Support for the coherent development of research policies Programme	0
<b>CAPACITIES - total</b>	<b>690</b>



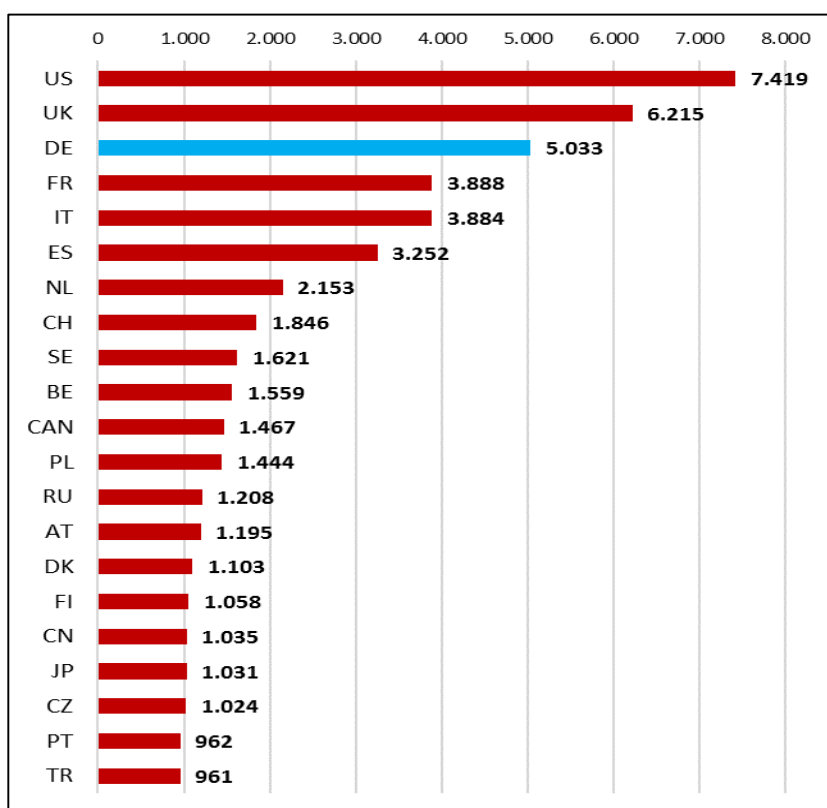
## 2. SCIENTIFIC PUBLICATIONS, 2008-2012<sup>3</sup>

Turning our attention to the degree of bilateral research collaboration, as measured by scientific publications, the absolute number of such publications co-authored by at least one German and one Greek author amounts to 5.033 (Table 4). This not only stands for almost 10% (9,4%) of the total Greek publications, but, more importantly, amounts to almost a quarter (22,2%) of Greek publications co-authored with a non-Greek author. Again, this bearing evidence of the centrality of the bilateral research collaboration, given that co-publications with German authors rank third, following only those co-publications performed together with US- and UK-based authors (Graph 3).

### **Scientific co-publications, 2008-2012, Table 4.**

No of scientific publications with GR-DE cooperation	5.033
% in total GR publications	9,4%
% in total GR publications with international cooperation	22,2%

### **The importance of cooperation for Greece, Top 20 countries, 2008-2012, Graph 3.**



<sup>3</sup> Bibliometric data are based on the Web of Science database, and refer to the time period 2008-2012. For a comprehensive account of Greek publications, refer to: National Documentation Centre, 2014, *Greek Scientific Publications 1998-2012; Bibliometric Analysis of Greek Publications in International Scientific Journals*, National Documentation Centre (<http://metrics.ekt.gr/el/node/176>).

Analyzing the institutions under the auspices of which the Greek co-author is based, the great majority is attributed to only one academic institution, that of University of Athens with 30%. It is followed by the University of Thessaloniki with 15% (Table 5).

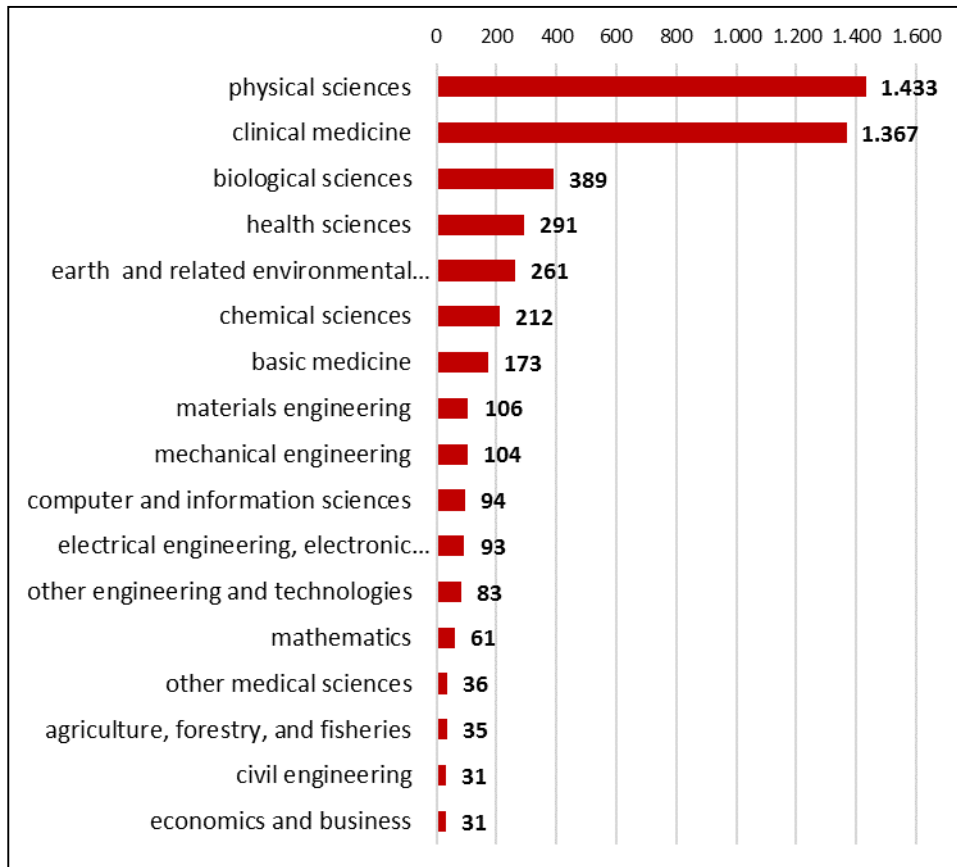
**Cooperating organizations, Table 5.**

GR ORGANIZATION	No of Publications
NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS	1.756
ARISTOTLE UNIVERSITY OF THESSALONIKI	869
NATIONAL TECHNICAL UNIVERSITY OF ATHENS - NTUA	498
UNIVERSITY OF IOANNINA	444
UNIVERSITY OF CRETE	416
NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS"	403
FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS	294
UNIVERSITY OF PATRAS	278
ACADEMY OF ATHENS	138
UNIVERSITY OF THE AEGEAN	128
DEMOKRITOS UNIVERSITY OF THRACE	123
NATIONAL OBSERVATORY OF ATHENS	107
UNIVERSITY OF THESSALY	89
HAROKOPIO UNIVERSITY OF ATHENS	83
NATIONAL HELLENIC RESEARCH FOUNDATION	67
HELLENIC CENTRE FOR MARINE RESEARCH	64

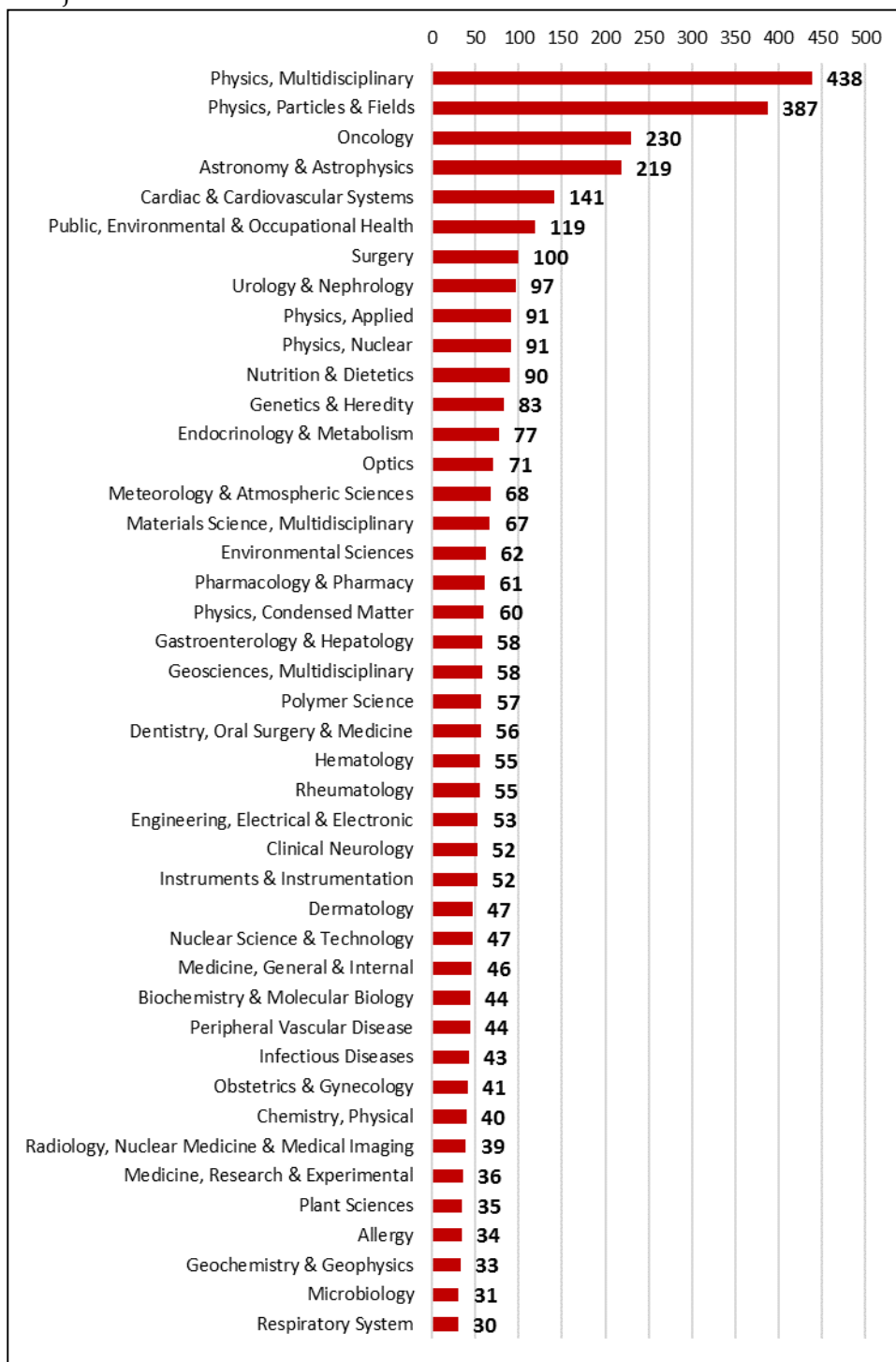
Analyzing the co-publication trend between the two countries taking into account the scientific fields of collaboration, it is evident that most of the co-publications take place in the so-called 'hard sciences', and more specific in the physical sciences and clinical medicine with a number of 1.433 and 1.367 respectively. This is the case making use of both the Frascati classification (as above noted) and the Web of Science subject field index.

**Scientific fields of cooperation, 2008-2012, Graph 4.**

4.a. Frascati classification.



#### 4.b. WoS subject field



### 3. BILATERAL R&D COOPERATION, 2013 – 2015<sup>4</sup>

Following the agreement between the German Federal Ministry for Education and Research (BMBF) and the General Secretariat for Research and Technology (GSRT) of the Ministry of Research, Education and Religious Affairs of the Hellenic Republic in 2013, to pursue a joint R&D Programme, the following table (6) presents an updated version of the progress made. It is to be noted that the projects are in their realization phase and have not been concluded.

Performing an analysis of the results, it is obvious that the field of Energy has been the prime source of cooperation having attracted almost a third (8 out of 28) of the total population of the projects. Ranked second is the field of Advanced Materials, Nanotechnologies, Nanosciences and Microelectronics with 6 projects. Lastly, all the Greek participants in this bilateral cooperation are academic and research institutes.

#### **Results of the bilateral R&D Cooperation, Table 6.**

R&D Field	No. of projects	Funding through Greek government investment budget
Energy	8	1.562.996 €
Advanced Materials, Nanotechnologies, Nanosciences and Microelectronics	6	915.000 €
Agriculture, Fisheries, Food and Biotechnology	3	535.000 €
Health	3	500.000 €
Societal and Economic Aspect of Development	3	495.096 €
ICT	3	404.800 €
Cultural Heritage	1	249.700 €
Environment	1	218.000 €
<b>Total</b>	<b>28</b>	<b>4.880.592 €</b>

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<sup>4</sup> Data provided to the National Documentation Centre by GSRT.