WISSENSCHAFTSRAT

Executive Summary Recommendations on the Role and Future Development of the Governmental Research Agencies with R&D Activities

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In May of 2004 the Federal Ministry of Education and Research (BMBF) commissioned the German Science Council to conduct a systematic evaluation of governmental research in Germany. The commission is based on a parliamentary resolution of the German Bundestag and entails the examination of all duties and responsibilities of Government Research Agencies (GRAs) with respect to relevance and the quality of their research and development activities (R&D). The evaluation aims at modernising GRAs – if necessary –, strengthening elements of competition, improving the quality and efficiency of research and finally contributing to better agency performance. The evaluation report at hand is based chiefly on a selection of 13 GRAs and a broad survey of statistical data on all 52 GRAs in 2005-2006. Commissioned by the BMBF in July 2006 to evaluate the remaining GRAs, the German Science Council will release a final report in 2009.

German GRAs are under the control of different Federal Ministries and derive their funding mainly from the federal budget. They are established by federal law or decree and as such are part of the public administration. The GRAs support the government and its ministries by providing science based services and R&D in certain fields. Among their key tasks are policy advice, information research, regulation and testing, as well as provision of services for industry and society. The scope of the respective agencies' activities and responsibilities differs considerably.

According to the survey of the German Science Council, the 52 Federal government laboratories spent 1.7 billion euro in 2004, including 590.5 million euro for R&D. In 2004, the agencies also provided 19 906 fulltime equivalent (FTE) workplaces, of which 5 064 were dedicated to university graduates engaged in science-based activities. According to the work schedule of the scientists, their involvement in R&D ranges from 0 % to 80 %.

GRAs vary significantly in terms of R&D activities. In 15 agencies, scientists dedicate over 50 % of their working time to R&D projects, while in eleven agencies scientists spent at most 10 % of their labour time conducting research activities. There are also three agencies without any R&D activities. In the case of the remaining GRAs, the share of R&D activities ranges from 20 % to 45 %.

The German Science Council has evaluated a selection of 13 GRAs. The work of the majority of these agencies is of high scientific quality. Among them are the German Development Institute (DIE), the Institute of Microbiological Research of the Federal Armed Forces, the Institute for International and Security Affairs (SWP), and the Federal Institute for Material Research and Testing (BAM). However, the German Science Council also diagnosed serious deficits in some agencies.

Taken as a group, however, German GRAs excel in the field of applied research, concentrating on process development and method testing in the natural sciences, engineering, and social sciences. Some of the agencies also generate data of unique scientific relevance, such as the Federal Office for Building and Regional Planning (BBR) and the National Metrological Service (DWD). Due to their problem-oriented and multi-disciplinary character, the majority of these agencies are especially well-qualified to conduct interdisciplinary research.

Furthermore, being embedded between public administration and R&D, GRAs are well-situated to provide scientific advice to the respective decision makers. Not only are they able to take account of political considerations when preparing scientific advice for policy-makers, but because of their intermediary position between politics and academia, GRAs are proficient in identifying future fields of political activity and defining policy-oriented research agendas. According to the evaluation of the German Science Council, a key task of GRAs is to anticipate and keep public administration abreast of developments and to initiate appropriate R&D activities in order to assist government.

In order to tackle these tasks effectively, GRAs have to both meet the expectations of public administrators, as well as satisfy the quality standards of scientific communities at the same time. A number of agencies such as DIE, BAM and SWP master the challenge of balancing these expectations. However, there are some agencies that are falling short in fulfilling this major responsibility of the GRAs.

In this context, the German Science Council considers the imbalance in the agencies' activities to the detriment of R&D as the main reason for the low scientific standard of work in government laboratories. Due to this imbalance, the GRAs cannot fully exploit their scientific potential. In some agencies, the in-house R&D activities are in decline and they can no longer conduct research in key areas. Hence, the agencies cannot guarantee that they meet their responsibility to conduct state-of-the-art research. Additionally, most of the agencies lack the freedom to conceptualize and carry out research on their own. In these cases, GRAs are no longer capable of providing prescient and pre-emptive policy advice. Furthermore, some of the agencies are insufficiently integrated with the scientific community at large and do not share its competitive orientation. This leads to deficits in research quality and topicality. There is also a considerable demand for quality management in the fields of R&D and scientific policy advising in a number of agencies. Some of the Federal Ministries, such as the Ministry of Food, Agriculture and Consumer Protection (BMELV) and the Ministry of Economics and Technology (BMWi), have already taken action in order to remedy these deficits.

According to the German Science Council, these deficits are mainly caused by developments within the following areas:

1. status and management of R&D activities within GRAs,
2. institutional framework, especially as it concerns the management of financial and human resources
3. coordination between agencies and ministries.

The following paragraphs summarize the recommendations of the German Science Council in these three areas. The recommendations aim at improving the quality of R&D as well as enabling an efficient use of public resources within the GRAs.

1. Recommendations on the status and management of R&D activities

In order to ensure reliable as well as prospective advice for public policy makers, GRAs have to be based on sound R&D activities, taking into account scientific progress as well as the demands of problem-solving in a complex world. Due to their limited financial and human resources, the institutes themselves can carry out R&D activities only to a limited degree. The majority of R&D activities have to be con-

ducted in cooperation with universities and other research institutions by commissioning scientists from outside the GRAs to conduct R&D projects. However, the GRAs need themselves also to engage in state-of-the-art research activities in order for them to identify suitable and appropriate partners of high scientific standing and to assign projects to state-of-the-art scientists. The German Science Council concedes that all R&D activities in GRAs are subordinated to the demands of the Federal Ministries and that the scientists are only partly involved into research projects. Nonetheless, it is vital that all R&D activities within GRAs comply with state-of-the-art scientific criteria in order to ensure sound scientific policy advice for public officials and and customers from different areas. Having evaluated 13 GRAs, the German Science Council concludes that some agencies do not yet fulfil these conditions. While some of the agencies, such as the BfR and the DIE, are already engaged in excellent R&D activities and display a high rate of integration with the scientific community, other GRAs do not meet these standards. Accordingly, the following recommendations are of varying importance to the respective institutes:

- Ensuring a sound R&D basis: Federal Ministries, being in charge of GRAs, have to ensure that the key responsibilities and duties of the agencies are based on sound scientific principles. Hence, in some agencies, the share of R&D activities has to be enhanced. The assignment of new responsibilities must not lead to diminished R&D activity.
- Encouraging in-house research initiatives: In order to develop anticipatory R&D projects, the German Science Council recommends the reservation of 10 % to 15 % of the agencies' annual budget for self-designed R&D activities oriented to the ministries' main responsibilities. By granting GRAs space for developing and conducting self-designed R&D projects, the institutes will be able to satisfy their advisory, regulatory, and testing responsibilities in a prescient and effective manner. Therefore, the agencies should always be free to choose the research methods they employ and to interpret the outcome of their research.
- Development of R&D-programs: Within two years, all GRAs should introduce long-term R&D-programs. The programs should be developed with the help of external experts, as well as in cooperation with the ministry and should specify well-defined research objectives. In doing so, a balance should be sought between short-, medium-, and long-term R&D projects.

- Introduction of R&D-management: Considering the importance of an effective management for successful R&D-activities, large institutes as well as institutes with a large share of R&D-activities should create a position for an R&D-manager. In the case of smaller institutes, the chief scientist should be given this task.
- Improvement of outsourced R&D-activities: The outsourcing of R&D-activities should be integrated with the medium-term R&D-program of each institute. This must be done in accordance with scientific criteria. Only in rare and justified exceptions should due process in the outsourcing of project be ignored. The German Science Council recommends dedicating 10 % of the annual budget for outsourced R&D to projects developed by scientists from outside, contributing to a general R&D focus of the ministry. In doing so, sufficient space for the development of R&D projects and the selection of methods can be ensured. This is an important precondition for acquiring new perspectives on policy issues and developing new solutions to the problems at hand. This opportunities arising from innovative R&D activities should be exploited more effectively.
- Improving cooperation between agencies and ministries: In order to guarantee an effective transfer of the R&D results between agencies and ministries, civil servants supervising the agencies within the ministries should be trained to judge the scientific basis of the results, as well as to promote the results to the interested parties within the ministry.
- Links to the scientific community: A number of agencies such as the BAM, the DIE and the SWP are both nationally and internationally very well integrated into the scientific community. Strong links to the scientific community are vital in order to ensure the scientific quality of the agencies' research activities. Furthermore, in the case of short term R&D-projects, agencies with a strong network of contracts with universities and research institutions are better prepared to find partners for cooperative R&D activities. In order to improve the links of GRAs to universities and research institutes, the German Science Council makes the following recommendations:
  - the number of third-party funded R&D activities in which universities or research institutions cooperate with GRAs should be increased with the aim of joint publications and patents
  - if possible, the leading scientific personnel of GRAs should be appointed in cooperation with neighbouring universities

  - the teaching activities of the agencies' scientific staff should be recognised as part of their responsibilities up to two hours per week
  - the exchange of scientific personnel between GRAs and universities or research institutions in Germany and abroad should be intensified
  - the cooperation of GRAs with similar institutes especially in the EU should be improved
- Enhancing competition: All institutes should be clearly oriented towards scientific competition. GRAs should expand third party funding especially from the European Union and the German Science Foundation (DFG) in order to consolidate their R&D budgets and to strengthen their scientific basis. In this context, the German Science Council recommends
  - introducing a general and consistent legal framework to simplify third party fund raising by GRAs. It remains unacceptable that third party fund-raising can lead to cuts in agency budgets
  - supporting scientific staff of GRAs in acquiring third party funding by offering incentives for successful applications
  - laying the foundations to dedicate 10 % to 15 % of the agencies' annual R&D budgets for competitive assignment to external scientists
  - establishing an achievement-oriented allocation of budgetary funds for research within agencies that have substantial R&D budgets.
- Introduction of quality management: Because GRAs combine R&D with numerous science-based activities, their quality management needs to fulfil special requirements. On the one hand, quality management procedures have to take into account the varying areas of R&D activities in each institute. On the other hand, GRAs should have at their disposal comparable and generally accepted instruments that ensure the scientific quality of their work. Therefore, the Federal Government should establish a consensus on basic procedures and instruments to be applied in all 52 GRAs. Regular assessments by internal and external review panels should be introduced as a key element of quality management. Additionally, the German Science Council strongly recommends that the Federal Ministries ensure
  - that every GRA has a scientific advisory board within the next two years.
  - that responsibilities and competencies of the scientific advisory boards are well articulated,

- o that central areas of the agencies are well represented by national and international experts from universities as well as non-university research establishments. When appointing new advisors, suggestions of board members should be taken into account.

The German Science Council addresses the following recommendations on quality managements primarily to the agencies:

- o All vacancies for scientific personnel should be publicly advertised. Selection of personnel should be carried out by considering scientific criteria. In the case of executive positions, management abilities should be taken into account.
- o All R&D activities should be regularly evaluated by the scientific community. In this context, the number of papers published in reviewed journals and the number of patents and licensing agreements should be increased. Furthermore, all agencies should strive to secure third party funding from the EU and the DFG and to expand R&D cooperation with other institutions.
- o GRAs should consult external experts when outsourcing R&D projects that fall outside the agency's main focus. All scientific contractors of the agencies should be obliged to publish the research results they derive from R&D cooperation with GRAs.
- o In advising policy makers, care should be taken to ensure independence and transparency. R&D activities designed to serve as the basis for policy decisions must be carried out in accordance with scientific standards.
- o All GRA research services provided to industry and society should avoid distorting economic competition and guarantee easy and prompt access to all services.

2. Recommendations for the institutional framework

Only a sound institutional framework that supports R&D and science based activities can guarantee high quality scientific research at GRAs. Given the dynamics of modern scientific processes, the institutional framework of the GRAs must be highly flexible, especially in the area of human resources and budgeting. Furthermore, it should enhance the agencies' competitiveness. The German Science Council recommends that the Federal Government and the German Bundestag develop a comparable set

of rules and guidelines for human resource management and financing of GRAs, taking into account the following aspects:

- Introducing flexible budgets: The Federal Ministry of Finance (BMF) and all Federal Ministries concerned should ensure the introduction and application of cost and activity accounting in all GRAs. The Federal Ministries must
  - facilitate shared funding opportunities between different budget items
  - ensure long-term transferability of budget items
  - cede surpluses to the agencies in the case of third party R&D funds without reducing basic agency budgets
  - cede surpluses to the agencies stemming from patents and licences to further transfer of technology
- Improving human resource management: The Federal Government and the German Bundestag should adjust public service and employment laws for the scientific staff of GRAs to make them comparable to regulations for other publicly financed research institutions. In this context, the Federal Government should consider
  - increasing the number of temporarily employed scientists up to 15 % of the permanent scientific staff. Preference should be given to young scientists
  - facilitating the creation of working places funded by third parties
  - introducing a flexible appointment scheme for scientific staff, as well as handling budget cuts more flexibly
  - developing strategies to safeguard the know-how of senior scientists
  - developing strategies to offer tenure positions to highly qualified, temporarily employed junior scientists
  - increasing the percentage of female scientists especially in management positions
  - abolishing administrative barriers for scientists from GRAs applying for sabbaticals universities or research institutions in Germany or abroad.
  - offering incentives to scientists from GRAs to improve the quality of their R&D activities
  - designing specialised professional development strategies

3. Recommendations on the coordination of GRAs

In order better to tap the full scientific potential of GRAs and to exploit their considerable financial and human resource means, the Federal Government should utilize existing instruments of coordination to the full. In particular, the legal framework for human resources and budget management in GRAs should be designed comparably, granting a higher degree of flexibility. Additionally, the German Science Council advises the Federal Government to agree on procedures to plan R&D infrastructure and general R&D themes for GRAs – taking the principle of departmental responsibility into account. In doing so, all Federal Ministries should pay particular attention to the following aspects:

- Above a minimum cession amount of 200,000 euro, the Federal Ministry of Education and Research (BMBF) and all relevant Federal Ministries should be informed of investments in R&D infrastructure. Furthermore, these investments should be coordinated between all relevant Federal Ministries.
- Above a minimum cession amount of 1.5 million euro all investments in R&D infrastructure should be subject to evaluation by external scientific experts.
- All Federal Ministries and their agencies should avoid installing redundant and expensive R&D infrastructure. The R&D infrastructure should instead be subject to use by scientists from all kinds of R&D establishments. Such joint use requires that information on the infrastructure be readily available. Therefore, within the next two years, the BMBF in cooperation with all other federal ministries should compile a compendium listing all R&D infrastructure in GRAs (especially instruments and data). This compendium should be made available to all universities and research establishments in Germany. The Government is also advised to release scientific use files to research data centres, thus granting external scientists access to specific data collections. If such data centres can not be created, other instruments such as work places for visiting scientists should be used to facilitate access.
- For relevant R&D themes, closer interdepartmental cooperation and coordination of all relevant Federal Ministries should be encouraged.

The German Science Council reserves the right to make further recommendations after completing the evaluation of all GRAs and to recommend more specific profiles and long-term development aims for the GRAs.