

Research Strategy Austria

"2.5% + plus"

Prosperity through Research and Innovation

1) Background

In its "Vision 2005 – Among the Best Through Innovation" the Austrian Council for Research and Technology Development defined the shared values, guiding principles and vision of its work. In a target bundle a vision for Austria in 2005 was drawn up and strategic guidelines were laid down.

In close consultation with selected experts and institutions, the strategy "2.5% + plus: Prosperity through Research and Innovation" was drawn up on the basis of this vision. The strategy is based on the conclusions of the "Vision 2005" and supplements these with the formulation of important strategy elements and a first package of measures as well as model calculations to quantify possible ways of achieving the goal. Together, the "Vision 2005" and the "2.5% + plus" constitute a comprehensive research strategy.

"2.5% + plus: Prosperity through Research and Innovation" is by no means a final paper to be worked through rigidly. On the contrary, this strategy should be discussed, adapted and added to as an open system in a continuing process, with individual concepts for detailed areas. Concrete measures will also be developed and implemented within the framework of a competition of ideas.

2) Objectives of the Research Strategy Austria

Austria is undoubtedly one of the wealthiest countries in the world. It has a high standard of living, an excellent social welfare system and environmental conditions, and in the global economy stands in strong competition with low wage countries.

In a highly developed country a research policy comprising all areas of society (natural and technical sciences, liberal arts, social and cultural sciences) is a central issue. The continuous cultivation and further development of the scientific knowledge base and its (technical) implementation is a basic requirement for maintaining the prosperity of a country.

For a country like Austria, international competitiveness is largely determined by the quality of its human resources, research and utilisation of technology. Austria has a good, though in some respects inefficient educational system. However, an international comparison shows that the country holds only a middling position with regard to the

utilisation of research and technology, and even suffers from substantial deficits in the field of technology development.

The goal of the Research Strategy Austria is to ensure the growth and expansion of competitive strength in demanding and high quality market segments through investments in RTD. The target will be for Austria to rank among the top third of OECD states in all important determining factors, namely research output, innovation performance, education and use of telecommunications.

The Austrian government has set itself the goal of increasing the R&D quota in terms of gross domestic product (GDP) from 1.8% at present to 2.0% in 2002 and then to 2.5% of GDP in the year 2005.

The Council for Research and Technology Development supports this goal and regards the increase of the R&D quota to this level as a central milestone.

The Council has called its strategy "2.5% + plus: Prosperity through Research and Innovation" in order to express the following considerations.

- An R&D quota of 2.5% in 2005 is a minimum value that will reduce the gap between Austria and the leading nations, but not close it completely.
- A 2.5% of GDP is a central milestone, but not the final goal to reach. In order to achieve growth and competitive strength, output indicators will have to be improved. For that reason, the efficiency with which resources are used is just as important as the provision of additional resources itself.
- The addition "Prosperity through Research and Innovation" expresses the fact that an increase in the R&D quota to 2.5% is not merely a motor for economic prosperity and thus the basis for employment, material prosperity and social security; R&D also represents a solid basis for the further social and cultural development and quality of life of this society.
- A research strategy requires appropriate complementary strategies, for example, in the fields of education, material and non-material infrastructures, in particular in the telecommunications sector.
- Past analyses have clearly demonstrated that the availability of qualified manpower is one of the central problems facing the economies of highly developed countries. Therefore, when drawing up a future oriented RTD policy special emphasis should be attached to measures to ensure highly qualified human resources as well as to the aspect of financial resources.

3) Strategy Elements for Achieving the Objectives

The Council for Research and Technology Development has drawn up a bundle of strategy elements with corresponding implementation elements. This bundle makes no claim to be complete. On the contrary, it summarises a number of important strategic elements that promise to be effective methods of promoting research, technology development and innovation.

Strategy Element 1: Securing long-term financing

A substantial increase in R&D expenditure by both the state and private sectors is required if the goal is to be realised. The appropriate figures are shown in the chapter "R&D Financing."

Equally important as increased funding for R&D is long-term planning security. This should be guaranteed by uncoupling R&D funding from the public sector R&D budget that has to be negotiated on a yearly basis.

The Council therefore attaches priority to the following measures:

- Allocation of the R&D funding required by means of:
 - Continuous increase of funding for R&D expenditure at national and federal level,
 - Realisation of additional long-term non-budgetary R&D funding, for instance in form of a foundation open to the public and private sectors (an appropriate model that also offers suitable tax incentives to promote private sector participation has been drawn up in the key points). In addition, external sources such as the dividend distributed by the Austrian National Bank or privatisation revenues from the national government and the *Länder* should be used for R&D purposes until an appropriate capital stock has been built up.
- Consistency of fiscal measures,
- Conclusion of a contract between the national government and the respective *Länder* governments to agree on shared priorities and a fair distribution of research financing between the local authorities and also to utilise synergies through closer networking between the players.

Strategy Element 2: Concentration on Activities with a Powerful Leverage Effect from Public to Private Funding

Increased activation of corporate research potential is a vital prerequisite for achieving the desired goal. For that reason, public funds should mainly focus on those areas where support measures can induce businesses to higher than average additional spending. In particular, this applies to the following approaches:

- Support for the establishment of new innovative and highly research intensive companies (see also strategy element 8);
- Stimulation of the potential for knowledge-based business start-ups at universities (spin-offs);
- Creation of incentive systems for increased co-operation between the scientific sector and business, for example by doubling third party funding obtained in the university and non-university sector;
- Concentration of research support on "dynamic" programmes, where the state grants could trigger sustained R&D expenditure by companies beyond the support period;
- Support for highly innovative, risky research projects with larger grants;
- Increased agreement of long-term leverage effects within the framework of R&D programmes by structuring supporting agreements (e.g. along the lines of the K-Plus centres).

Strategy Element 3: Developing Strengths – Promoting Emerging Fields for the Future

In close consultation with experts and on the basis of existing relevant studies, the Council for Research and Technology Development has drawn up a first list of Austrian strengths and emerging areas in the fields of basic and applied research as well as in technology development. This should be seen as an open list and a basis for future discussions, expansions and deepening. The Council works on a continuous specification of these Austrian strengths and invites experts from all areas to provide their input.

The Council recommends that these strengths and emerging fields be taken into consideration in the following forms when drawing up research and technology policies:

- Support for thematically oriented impulse programmes should focus on existing strengths and opportunities, whereby linking these programmes with international activities (e.g. EU Framework Programmes, specific co-operation programmes with central and eastern European countries) has to be taken into account when defining topics and designing programmes;
- a funding bonus for projects in identified fields of strength within horizontal support programmes (e.g. Industrial Research Promotion Funds) should be created and covered from additional funds. This will not affect support for innovative projects outside the defined focal area.

The Council will orient itself by the following technology areas for which some Austrian strengths are listed as examples. This list has to be seen as an open one to which further strengths and emerging fields will be added in the course of a competition of ideas

which recently has begun. Moreover it is necessary that existing strengths are continuously evaluated according to international standards. The following technology areas and strengths have – among others - been identified as pointing the way ahead:

- life sciences, e.g. biotechnology, genetic engineering, medical technology
- information and communication technologies, e.g. multimedia technologies, e-business, digital content, micro-electronics, telecommunication;
- nano- and micro-technologies;
- mobility and transport, e.g. intermodality, transport logistics, vehicle technologies, tunnel technologies;
- environment and energy, e.g. sustainable energy technologies, environmentally compatible construction and housing.

Strategy Element 4: Promote Co-operation

Improving co-operation between the players in the national innovation system is a key component of a successful R&D policy. As part of this process

- impulses for greater co-operation between universities, non-university research institutes (e.g. Austrian Academy of Sciences, Joanneum Research, Research Centre Seibersdorf, Christian Doppler Laboratories, ACR-Institutes, Competence Centres, polytechnic colleges etc) and business should be set through the implementation and expansion of targeted funding programmes;
- institutional interfaces should be created, for example, by promoting the creation of the clusters and
- above all, structural reforms should ensure improved co-operation between the development agencies in the broadest sense (ministries, funds, *Länder*).

In view of the large number of players and programmes, the Council for Research and Technology Development sees the necessity of simplifying the present system of Austrian business promotion at a national and regional level, to make it more customer-friendly and to re-orient it by technology and innovation related criteria. Appropriate structural proposals will be drawn up by the Council.

Strategy Element 5: Creating/Improving Awareness

The Council for Research and Technology sees an urgent need to raise public understanding of the benefits of research, technology and innovation for the economic, social and cultural development of our society.

- As a co-ordinating nucleus, the Council will initiate a broad based image campaign for research and technology to be carried out in co-operation with the government and other players (e.g. *Länder*, social partners, lobbies etc.).
- Public relations work of all scientific institutions should be strengthened with the aim of informing a broad audience about their own activities and plans.
- The statistical information system in the area of science, research and technology must be improved; redeploying of resources within the “Statistik Austria” is suggested.

Strategy Element 6: Incentives for Increasing Participation in Research

The majority of Austrian enterprises, especially the small and medium-sized enterprises have not been involved in research and development up to now. The Council sees the necessity here for drawing new players into regular innovation activities. On the one hand, incentives should be provided for starting development activities, while on the other hand, the means for an efficient transfer of technology should be provided. A special focus to increase innovative strength should be planned for the service sector.

In detail, the Council recommends:

- Making the creation of awareness among SMEs a focal area of public relations work;
- Establishing mobility programmes to encourage the transfer of researchers into industry;
- Establishing innovation programmes to create the requisite internal conditions at SMEs;
- implementing specific RTD co-operation programmes for small and medium-sized enterprises;
- expanding and intensifying the range of support for technology transfer;
- improving information on funding opportunities available at banks.

If such activities are to be successful, businesses will have to be actively approached and provided with convincing arguments.

Strategy Element 7: Strengthening the Accelerators (Human Resources and Information Technology)

The Council for Research and Technology Development calls for pro-active programmes and initiatives to complement the Research Strategy Austria in human resources and telecommunications/information technology.

Human resources

The existence of qualified and motivated manpower is of central importance for the competitiveness of both the Austrian economy and science.

In view of its central importance as the basis for increasing Austrian research output, education is one of Austria's strengths that should be bolstered still further. Existing weaknesses such as output deficits in the tertiary sector or the lack of sufficient ICT specialists must be remedied. In this connection, we refer you to the contents of the paper "Vision 2005." The Council calls upon the government to expand and implement an educational concept that covers all stages of the system. Programmes (e.g. the IMST-project) fostering interest in and understanding for technical and science subjects in the secondary stage of the education system should be extended.

Despite the increasing deficit of qualified personnel in economy and research women are still underrepresented both in relevant education segments and in careers. Therefore, the Council in co-operation with the relevant players will support measures motivating more women to start careers in research and technology development, especially in technical and science subjects, and promoting their careers appropriately.

Moreover, international and transsectoral mobility of researchers is of crucial importance for strengthening human resources in research. It is therefore necessary to remove existing obstacles to mobility, especially the legal ones. In addition adequate measures supporting the mobility of young researchers (e.g. fellowships) have to be taken.

Telecommunications / Information and Communications Technologies

The ICT sector plays an important role as an accelerator for research and technological development. The Council therefore proposes an ICT initiative with the aim of improving Austria's position in this field from 9th place in Europe to 5th place by 2005.

The federal government has already started a number of fruitful actions in the field of ICT (players (e-Austria, e-business, e-government etc.). Due to its nature as a classical cross-sectional field, competence in this area is highly fragmented. Therefore the Council considers the appointment of a responsible ICT co-ordinator to bundle activities, as well as the definition of a binding strategy with appropriate milestones and control mechanisms to be a necessity.

Strategy Element 8: Promotion of Innovative Start-ups

In an international comparison, Austria has a lower than average entrepreneur quota and business start-up rate, especially in the innovative sector. The Council therefore proposes the following bundle of activities to support innovative business start-ups:

- Strengthening advisory services for start-ups and start-up support measures,

- Support in early stage financing,
- Specific programmes to promote university spin-off: special start-up grants for members of universities, polytechnic colleges and non-university R&D institutions (incubator models),
- Improved synchronisation of support for regional infrastructures and transfer facilities between national government and the *Länder*,
- Easing bureaucratic and fiscal conditions for new companies; in order to make a business start more attractive, a tax deduction should be introduced to supplement the research tax allowance as a first step.

Strategy element 9: Regional Priorities within the Emerging European Research Area

The decentralised SME-economy structure requires an adequate decentralised research and development structure. This means co-ordinated setting of priorities in the *Länder* reaching from education to Centres of Excellence in certain fields. The Council regards contracts between the federal government and the *Länder* as appropriate means to that end. Besides, cross-border co-operation of regions within the emerging European Research Areas is of major importance.

Strategy element 10: Activities with a "Double Dividend"

In many areas the economic benefits of research and technology development go hand in hand with an additional benefit to society and RTD fulfils public tasks. This includes, for example, activities in the environmental or health sectors, in food safety, in transport or climate issues but also in the co-operation with strategic partners in central and eastern European countries. It is important to develop problem solving competence especially in these areas. A strong implementation orientation will be required to reap this "double dividend."

The Council therefore proposes that the aspect of social benefit be taken into account when designing and implementing impulse programmes, both with regard to the topic and in the evaluation of the projects by appropriately weighting the implementation aspects of the new technologies.

4) The Liberal Arts, Social and Cultural Sciences

The liberal arts, and cultural and social sciences play an important role in our society. Therefore, the Council for Research and Technology Development has paid special attention to them in its strategic deliberations.

The Council suggests that the financial resources available from the public budget for the humanities, cultural and social sciences be increased in proportion to the expenditure for universities in general. The prerequisites for this are:

- regular international evaluations
- greater integration in national and international networks,
- promotion of co-operation, especially between university and non-university research.

These areas of science are especially important in connection with the realisation of the image campaign (compare strategy element 5). Furthermore, the integration of cultural content in particular should be promoted within the scope of "digital content" production.

As specific measures

- special budgets should be made available at the FWF (Austrian Science Fund) to compensate for the lack of opportunities to obtain funding from industry
- national co-financing of international projects (EU, OECD) should be simplified and
- programmes lasting several years should be developed to finance centres of excellence.

The Council will draw up specific proposals this year in co-operation with the relevant players from the liberal arts, cultural and social sciences.

5) R&D Financing

5.1. Scenarios and Model Calculations

It should be said straight away that the following figures are partly based on estimates and projections, as unfortunately there are no current data available for the classification of expenditures according to implementation sectors. The following remarks will therefore need to be revised once Statistik Austria has published the latest figures in June 2001.

In 2000 approx. ATS 50 billion were spent on R&D. Increasing the R&D quota to 2.5% of GDP by 2005 (on the basis of the latest GDP forecast by the WIFO) means annual R&D expenditure will be increased from approx. ATS 50 billion in 2000 to some ATS 86 billion in 2005.

To achieve the interim goal of an R&D quota of 2.0% 2002, some ATS 61 billion will have to be spent on R&D in 2002.

Distribution According to Financing Sectors

In 2000 some ATS 20 billion of this R&D expenditure were provided by the public purse and approx. 30 billion were supplied by business, including foreign companies.

Assuming constant financing percentages (public: business = 40: 60) this means

- approx. ATS 24 billion for the public sector and approx. ATS 37 billion for the business sector in 2002,
- approx. ATS 34.5 billion for the public sector and approx. ATS 51.5 billion for the business sector in 2005.

In this connection, the Council for Research and Technology notes that a significant reduction in the share of public expenditure is desirable in the long term, but that closing the innovation policy gap on the scale recommended by the Council will not be possible without such additional public funding.

Therefore, assuming a constant distribution of public funds between national government, the *Länder* and other sponsors, the necessary expenditure of the national government can be estimated at

- ATS 20.5 billion in 2002,
- ATS 29 billion in 2005.

Additional Requirement

1) Additional requirement in comparison with R&D-expenditures in 2000 (ATS 50 billion)

The additional financing requirement for the total Austrian R&D expenditure will amount to some ATS 36 billion in 2005 compared to R&D expenditures in 2000. Assuming the need for a constant increase over the years, the additional requirement accumulated over the years is approx. ATS 94 billion.

Assuming a constant distribution between public and business R&D financing this means an additional funding requirement of approx. ATS 13 billion for the national government. Accumulated over the years this extra demand is approx. ATS 35 billion including the ATS 7 billion of special funding which have already been made available.

2) Additional requirement in comparison with the R&D expenditures at a constant R&D-quota of 1,79% (as in 2000)

In comparison with a model of constant R&D-quota the additional requirement for the overall Austrian R&D expenditures will be approx. ATS 23 billion in 2005, accumulated over the years approx. ATS 54 billion.

3) Additional requirement in comparison with the R&D expenditures at a constantly increasing R&D quota up to 2,0% in 2005

The increase in R&D expenditures outlined above is significant and appears difficult to realise at first sight. However, if one examines expenditure developments in recent years (substantial increase from 1995 to 2000) and dynamically extrapolates this until 2005 an R&D quota of 2% (ATS 68 billion) in 2005 could be expected.

As against this scenario, the additional expenditure in 2005 amounts to approx. ATS 18 billion, accumulated over the years to approx. ATS 42 billion.

Distribution According to Implementation Sectors – Necessary Structural Reforms

A distribution of R&D expenditure in 2000 in terms of implementation sectors produces the following picture:

- University research: approx. ATS 13 billion
- Non-university sector (co-operative sector, polytechnic colleges, transfer institutions, state and non-profit research institutions, competence centres, Austrian Academy of Sciences, etc.): approx. ATS 7 billion
- Corporate sector: approx. ATS 29 billion

This structure needs to undergo a fundamental change; a shift towards industry bearing a greater share of the research burden cannot be avoided. For that reason, a percentage increase in state grants for companies is a suitable instrument, even though high levels of public grants for industrial research is usually characteristic of countries with little innovative strength. However, over the long term this increase should induce self-sustaining structures that will permit the percentage share of public funding to be reduced in subsequent years.

In its future detailed work, the Council will therefore orient itself to the following rough structure:

- For universities a valorised projection of past expenditure is proposed, whereby great improvements in efficiency should lead to better use of funding.

Target for 2005: ATS 15 billion, with an increase in third party funding up to ATS 17 billion (Principle 1:1)

- The non-university sector provides the soil for an especially dynamic development. A stronger than average leverage effect is expected particularly among the competence centres and competence clusters, as well as in the business related non-university sector.

Target 2005: ATS 20 billion, this represents an almost threefold increase over present levels (Principle: 1:~3)

- The corporate sector (incl. foreign companies) has developed extremely dynamically in recent years. If the trend continues, an increase to approx. ATS 42 billion can be expected by 2005.

Target 2005: ATS 50 billion (Principle: 1:<2)

5.2. Distribution of the ATS 7 billion in Special Funds

In the 2001 budget, the government provided ATS 7 billion in special funds that can also be used as reserves. With that the government has enabled an optimal start of the innovation initiative. However, the above calculations show, that new additional funding will already have to be provided in 2003 to achieve the desired increase in the R&D quota.

The Council for Research and Technology Development was asked to make recommendations with regard to the distribution of these funds. In its recommendations, the Council was guided by the following considerations and strategies.

- As an immediate measure the Council meetings of January and March 2001 issued recommendations that permitted the continuation of undisputed and internationally evaluated programmes and initiatives.
- In preparation for the award of further instalments, the Council advocated a competition of ideas and called upon all relevant players in the Austrian innovation system to contribute ideas and concepts for new programmes and initiatives. Although this process has only started recently, the Council has already received a great many suggestions.
- When making future recommendations for awarding funds, the Council will be guided, on the one hand, by the suggestions made by the ministries and other players, and by the results of past analytical activity on the other.

The time and amount of future R&D special funding will have to be included in the calculation as a crucial framework condition.

The leverage and other effects of the measures financed by the ATS 7 billion in special funding have to be evaluated in an international benchmark. Independently from such analyses which can only be performed with several years delay, additional funding will have to be available as of 2003. The model calculations above clearly show that else it would be impossible to achieve the research policy goal of an R&D quota of 2.5% of GDP by 2005.

6) Conclusion

The government's research policy goal of increasing research expenditure to 2.5% by 2005 is an ambitious one. The Council for Research and Technology Development regards it as a milestone on the road to a sustained development of the Austrian innovation system and as the basis for creating and securing jobs as well as for safeguarding the quality of life of Austrian society. Therefore the Council invites all relevant players to co-operate in the implementation of the "2.5% + plus: Prosperity through Research and Innovation" strategy.