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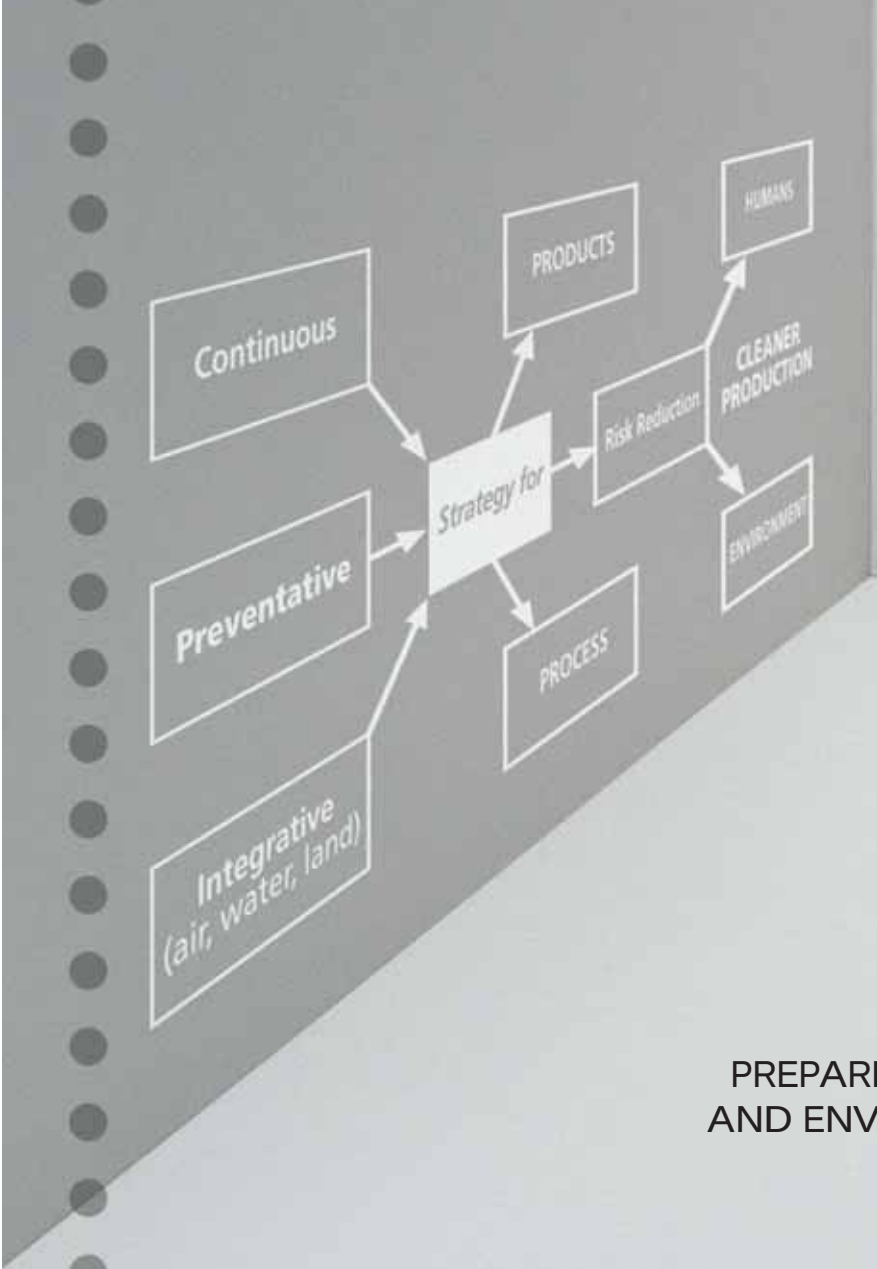
ENVIRONMENT



CLEANER PRODUCTION

TREND-SETTING EXAMPLES IN AUSTRIA

PREPARE - A METHOD FOR AN INNOVATIVE AND ENVIRONMENTALLY SOUND ECONOMY

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TREND-SETTING EXAMPLES FOR CLEANER PRODUCTION IN AUSTRIA

Initiatives for "preventive protection of the environment" in enterprises.

■ Until the end of the 1980's, environmental protection was almost exclusively considered synonymous with the use of technological solutions to reduce emissions. By means of end-of-pipe technologies, the industry tried to reduce waste and emissions at the limits of the production site. This philosophy only considered the environmental medium into which emissions were discharged, i.e. the medium in which the environmental problem occurred. The ever increasing global pollution of the environment and the exacerbation of the waste disposal problem show the limitations of this sort of approach. Follow-up technologies often transpose emissions into another medium; thus, while the problem is solved in the immediate vicinity of the production site, severe environmental damage occurs elsewhere. For this reason, Austrian research policy looked for alternative solutions to avoid this dilemma at an early stage. In 1989 already, the "Research Concept for Environmental Technology" attributed first priority to the development of low-emission technologies. Since then, "trans-media", "preventive", and "integrated" were to be important requirements for research in the field of environmental technologies.

The international concept of ***CLEANER PRODUCTION*** offers a new systematic approach. This slogan refers to innovation strategies implemented in some big companies in the U.S.A. which rely on integrated and preventive methods of environmental protection. This approach does not merely concentrate on individual installations causing emissions but also analyzes the technological, organizational, and economic processes causing these emissions. Thus, the Cleaner Production approach considers waste and emissions being symptoms the causes of which lie in the interaction of the different stages of the production process ("from symptom to source"). The potential for reduction of this comprehensive approach is so high that some pilot companies in the U.S.A. and Europe already envisage the goal of "zero-waste production".

What makes Cleaner Production attractive to professional users is, however, not only the reduction of emissions. While it has been a common belief that measures ensuring the protection of the environment merely cause additional costs, the Cleaner Production approach clearly shows that the avoidance of emissions and waste will benefit enterprises from an economic point of view as well. A reduction of emissions at source brings about an enormous improvement in the efficient use of resources; correctly applied, the Cleaner Production approach comprises an analysis of weak points and appropriate countermeasures, which present the company with a great potential for savings and, thus, give it considerable economic advantages.

At the instigation of the Netherlands, the PREPARE (Preventive Environmental Protection Approaches in Europe) and ECODESIGN programs were initiated within the scope of EUREKA/EUROENVIRON in 1989; the programs aim at promoting the idea and improving the practicability of Cleaner Production measures in Europe. As early as 1991, the first Austrian PREPARE program was started under the auspices of the Federal Ministry of Science and Transport and was also supported by the Federal Ministry of Environment, Youth, and Family, the Innovation and Technology Fund, the Federation of Austrian Industrialists, and the Austrian Economic Chamber; within the scope of this program, twelve case studies were conducted in enterprises belonging to different industries. The program objectives were the adaptation, further development, and demonstration of methods based on the Cleaner Production approach in order to pave the way toward an environmental management concept.

Similar programs using this methodical approach developed in parallel at a local level, too. In 1991, the cooperation between the City of Graz, Austria, several companies, the Graz Environmental Protection Agency, and the Graz University of Technology resulted in the foundation of the ÖKOPROFIT-project which, after having conducted case studies in five companies was transformed, in 1993, into a broader program aiming predominantly at small and medium scale businesses. The objective of the program was to involve interested companies in an interactive didactic process and to help them solve their waste and emission problems on their own. Similar programs have been introduced in some other cities all over Austria, and participating companies will be granted an award by the respective city after the program has been implemented.

In 1993, the PREPARE program was continued on a broader basis and extended to the regional level. Owing to the support of ITF, seven *Länder* were able to implement regional PREPARE programs involving a total of fifty case studies. This constitutes a major contribution to the dissemination of information and experience among companies and authorities. There is a continuous exchange of experiences going on in regional PREPARE workshops and the annual Austrian Cleaner Production Roundtable.

Austria has been a member of the international PREPARE Working Group since 1990 and will host the international PREPARE Secretariat in 1998 and 1999. In 1994, the "European Roundtable on Cleaner Production" took place in Graz and in 1996, Austria was invited to chair the establishment of this scientific communications network.

CLEANER PRODUCTION

"...the continuous application of an integrated preventive environmental strategy to processes and products to reduce risks to humans and the environment." (UNEP, 1994)

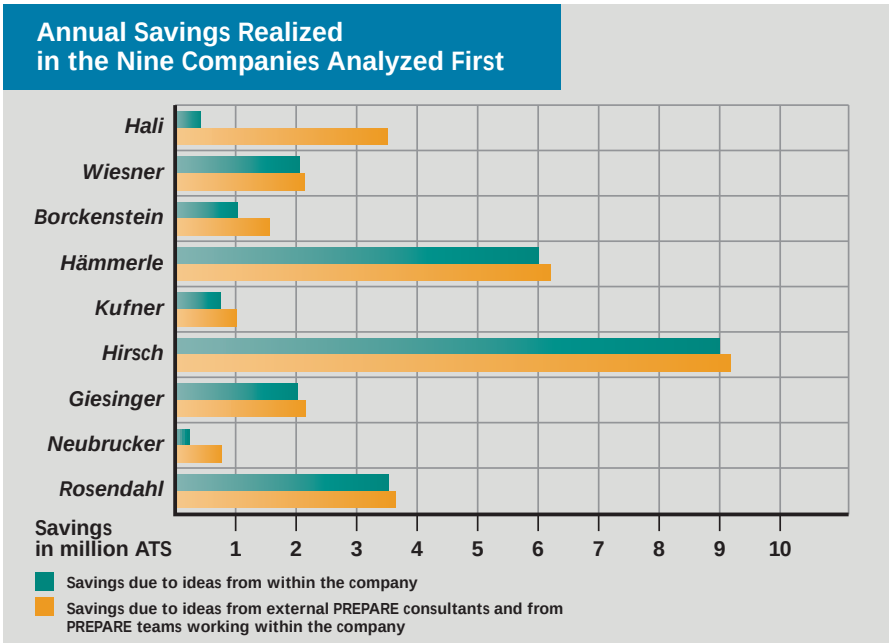
RESULTS AND EVALUATION OF AUSTRIAN INITIATIVES

"Protection of the environment means more than separation of waste and clean emissions. If correctly applied, protection of the environment will economically benefit companies in the medium-term."

■ Research in the field of Cleaner Production in Austria, based on a comprehensive approach, started about six years ago. With a rather unconventional concept for the dissemination of research results the program has succeeded, within a short period of time, to implement these results within the scope of programs initiated on a regional basis in a number of companies, which soon became models for innovative and preventive protection of the environment. "Environmental protection as a matter of self-interest" in combination with customized subsidies and grants may thus be a promising approach to the prevention of waste and emissions.

Much of the success of these programs must be attributed to the careful use of materials and to the use of alternative resources and auxiliary materials. These measures are particularly cost-efficient and reduce waste and emissions within a short period of time. Further potential for improvement lies in a more intensive monitoring of relevant data, training of employees, and in restructuring the organization/logistics in the field of purchase, handling, and disposal. Technological changes constitute another important contribution, however, they usually require larger investments. Internal recycling, closing of cycles, and process-integrated recycling technologies play and important role, especially in big companies. As recent examples have shown, external recycling plays only a minor role in reducing costs.

To sum up, experience gathered from completed programs has shown that, by a reduction of material and energy input the investment costs necessary for restructuring usually pay off within one year, already. The participation of all levels of the company - e.g. within an environment team and specific programs to enhance employee-awareness are important prerequisites for the successful implementation of all these measures. All projects have shown that essential proposals for improvement often were submitted by company employees. Concomitant research work accompanying Cleaner Production projects realized in Austria analyzed and evaluated the results and farther reaching effects.



Investment costs and savings given separately for joint solutions submitted by the PREPARE team and solutions coming solely from the company.

CONTRIBUTIONS TO THE IMPLEMENTATION OF THE OBJECTIVES OF CLEANER PRODUCTION PROJECTS

Joanneum Research, Institute of Technology and Regional Policy, M. Steiner

The research project studied the possible economic effects of state funded Cleaner Production programs. The effects were assessed on the basis of interviews with experts and already existing documentation of project analyses. Effects were identified in the field of environment, technology, and regional policies, as well as applied economics and go far beyond the effects taken into account to date: prevention of emissions, conservation of resources, and reduction of production costs. Effects identified by the study can be attributed to seven major categories: improvement of the environment, furthering of cooperation, enhancement of strategic thinking, broadening of the basis of information, increased activity aiming at innovation, and improvement of the dissemination of knowledge, and of the qualification of employees. A comparison of potential effects with present political objectives (laid down in environment programs, concepts regarding technology policies, innovation, and regional economic policies, as well as in uniform program planning documents for EU objective areas) has yielded a comprehensive demonstration of the beneficial effects of Cleaner Production programs as an instrument of public management. Last but not least, the study has highlighted some concrete, potential fields of application for Cleaner Production programs on the national, regional, and local levels.

EVALUATION OF THE STATE FUNDED ENVIRONMENTAL AUDIT ("ÖKO-AUDIT")-PILOT PROGRAM AND OF THE UPPER AUSTRIA PREPARE-PROGRAM

Studies by the Upper Austrian Environment Academy,
Institute of Applied Environment Research, D. Kanatschnig

One of the studies evaluated the "Öko-Audit" pilot programs implemented in Austria and supported by the Innovation and Technology Fund (ITF). For the purpose of this study interviews were conducted with twenty-nine companies, which had implemented an environmental management audit system and applied for an EMAS certification.

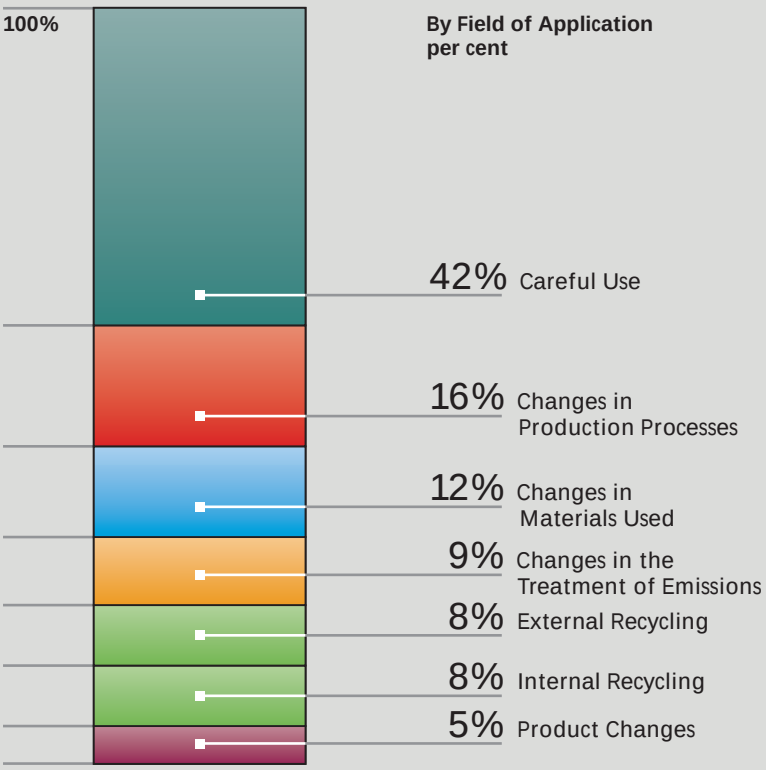
Experiences gained from the introduction of an environmental management system and the problems arising during the implementation phase constituted the center of attention. Moreover, the study analyzed to what extent the objectives of the program have been implemented (reduction of the risk of early implementation, dissemination of know-how, strengthening of "environmental protection" as a competitive factor, and promotion of the concept of preventive environmental protection). This procedure was to analyze the effectiveness of the EMAS-directive as to its ecologic and economic impact.

The study provides evidence for the cost-effectiveness as well as for the feasibility of EMAS-projects. 90% of the measures proposed within the framework of the environment-program were implemented within a period of 1.5 years; the average internal and external costs of the Eco-Audit paid off within 14 months. Ecological benefits were realized in particular by measures aiming at waste reduction and raw material conservation. Enterprises especially appreciated the effects the project had on their employees. Approximately 50% of the participating companies stated that there was an increased awareness among employees as to the environmental context of the production process as well as an improvement of the state of information concerning environmental issues within the company as a whole. Eight of the enterprises participating in the study had previously taken part in the PREPARE-Project; the study therefore also includes PREPARE-specific questions and analyzes in how far PREPARE may afford efficient preparatory work prior to the introduction of an environmental management system. It has been shown that previous positive experience with PREPARE increased the motivation within enterprises, which were prepared to introduce an environment management system even without subsidies. During implementation, PREPARE enterprises turned out to be faster in taking the necessary measures than others.

Methods developed for data collection enable consultants to assess the depth of the project and, thus, the quality of the environmental audit. It turned out that PREPARE-enterprises more readily applied in-depth instruments such as process flow chart, material flow analyses, and ABC classification and, therefore, attained greater effects and, more often than not, a higher potential for savings.

Another evaluation was conducted within the framework of a PREPARE-project realized in the province of Upper Austria. At first, the PREPARE method was applied in six companies. Here too, the results have shown that enterprises using environmentally acceptable modes of production also benefit from an economic point of view. The six companies showed a potential for savings ranging from ATS 2.6 million to more than ATS 6 million.

Distribution of Environmental Protection Solutions Developed within the Framework of PREPARE-Projects



Sources: PREPARE Austria, in-house computations

THE PREPARE INITIATIVE

PREPARE is an informal network initiated within the scope of EUREKA/EUROENVIRON with the aim to promote waste and emission preventing strategies and technologies.

An innovative economic development calls for modes of production making efficient use of raw materials and energy and preventing or reducing waste and emissions instead of recycling or disposing them. The method developed within the scope of the PREPARE initiative provides for an approach which promotes an innovative and environment-oriented business management through a comprehensive analysis of production processes. In addition to obvious environmental improvements such as the reduction and prevention of waste and emissions the efficient use of material and energy resources also brings economic advantages for participating enterprises. Companies were able to strengthen their innovation-oriented strategies and to promote employees' awareness for environmental protection and efficient use of resources, which, in turn, is reflected by an improved motivation among employees. Moreover, there are advantages for the national economy which by far exceed the value of the prevented environmental damage. Among these benefits one might mention the improvement of qualification in general and the enhancement of cooperation with research centers as well as with other enterprises, which ultimately benefits the securing of jobs.

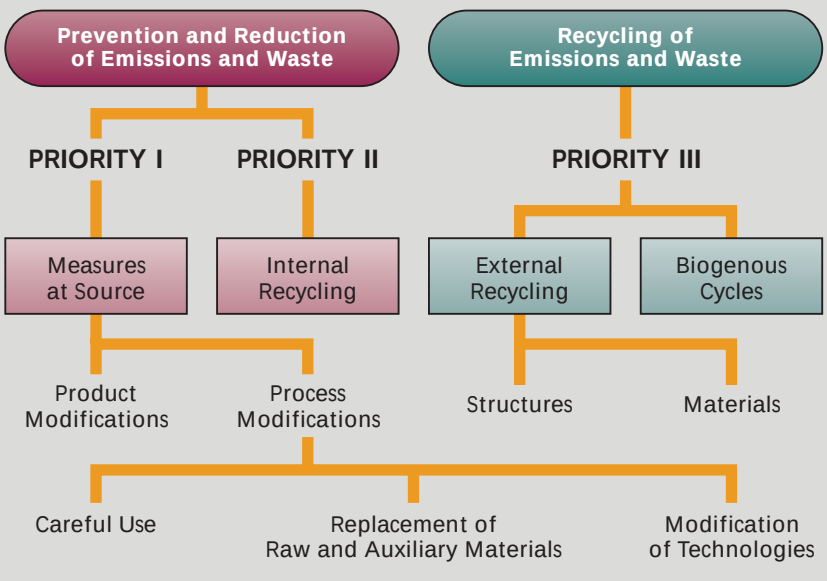
The PREPARE method is based on a combination of managerial and process-oriented approaches. It consists of several different stages: Information, data collection, monitoring and evaluation of material flows, documentation, and, finally, definition of follow-up activities. The essential part of each PREPARE project consists in the introduction of an environmental management audit system established on the basis of this analysis. Upon completion of a PREPARE project, concrete savings are already accomplished and a plan for further savings measures is elaborated. The new environmental management system makes material and energy flows transparent and thus safeguards control of the efficiency of material input and, in the course of several years, yields comparable balances.

The input/output and weakness analysis , which are constituent elements of the PREPARE method, are a sound basis for enterprises wishing to participate in an ***environmental audit,*** i.e. in an environment-oriented analysis of the company according to the EU-EMAS directive or according to ISO 14000. The elaboration of a quality assurance system according to ISO 9000 also seems to be useful in this context.

PREPARE was established in 1991 as an international initiative within the scope of EUREKA. Its objective is to promote preventive environmental protection measures and technologies in enterprises. Appropriate approaches for the implementation of preventive solutions are to be developed and tested in projects carried out on a national basis. Continuous international exchange of information and experience provides for an efficient and concerted development and promotes international research cooperation. Results yielded by ongoing projects are reflected in successful case studies and workshops for the industry organized within the scope of EU and EUREKA research programs. In addition, PREPARE establishes theme-centered networks, which constitute an important contribution to the exchange of information with a view to implementing research results.

*An **environmental audit** as required by the EU directive on environmental management and by the EMAS directive presupposes existing environmental management and information systems. PREPARE supplies a sound basis for the fulfillment of this prerequisite.*

Priorities for Integrated and Preventive Environment Protection



P E R S P E C T I V E S

STRATEGIES FOR THE DISSEMINATION OF CLEANER PRODUCTION POLICIES

A recent study conducted by the Process Engineering Institute at Graz University of Technology (Jantschgi, Fresner, Schnitzer), based on the analysis of programs realized in the U.S.A. proposes new approaches to the dissemination of Cleaner Production methods and also develops strategies for the implementation of this concept in Austria. From a whole gamut of ideas, the authors of the study have distilled a number of innovative elements particularly appropriate for the implementation of these principles in Austria and have also described concrete measures for a short-term realization. These include:

- Selective information campaigns aiming at the dissemination of the principles of the national environment plan and at the definition of reduction goals for individual sectors of the Austrian industry and trades.
- Sponsoring of awards and prizes for cleaner industrial production
- Organization of "Pollution Prevention Days" in order to introduce the idea of Cleaner Production to the public and to demonstrate the potential advantages of the concept
- Training of civil servants in order to promote the concept of Cleaner Production in enterprises via the administrative authorities
- "Information Clearinghouse" in order to provide enterprises with relevant information on novel raw materials and technologies
- "Bring Your Parts"-workshops as an opportunity for enterprises to learn in practice and without obligation about new technologies suitable for their special needs.

F I G U R E S / D A T A / F A C T S

PROJECT SPONSORS

The PREPARE pilot program was initiated in 1991 at the instigation of the Federal Ministry of Science and Transport in cooperation with the Federal Ministry of Environment, Youth and Family and with the support of the Innovation and Technology Fund, the Federation of Austrian Industrialists, and the Austrian Economic Chamber.

Regional follow-up programs were supported by the individual *Länder* as well as by the ITF. Different parallel research projects have been commissioned and published in cooperation between the Federal Ministry of Economic Affairs, the Federal Ministry of Environment, Youth and Family and the *Länder.*

INFORMATION

ACPC-Austrian Cleaner Production Center, Messendorfgrund 30, A-8042 Graz, Austria.

PUBLICATIONS

PREPARE Österreich ***TOOL-KIT - Textbücher, Lösungen und Arbeitsblätter***
commissioned by the Federal Ministry of Science and Transport and the Federal Ministry of Environment, Youth and Family. A joint publication by ÖIW Vienna, STENUM GmbH Graz, and the Graz University of Technology. Graz, Vienna, 1995.

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presented within the framework of the Upper Austria PREPARE regional program, commissioned by the Federal Ministry of Science and Transport and the Federal Ministry of Environment, Youth and Family. OÖ Umweltakademie, Institute of Applied Environment Research, Linz.
Project Director: Univ.Doz. Dr. Dietmar Kanatschnig.

Zielerreichungsbeiträge von Cleaner Production Projekten
A macroeconomic analysis based on the example of the Austrian PREPARE program, commissioned by the Federal Ministry of Science and Transport. Institut für Technologie und Regionalpolitik, Joanneum Research, Graz. Project Director: Univ.Doz. DDr. Michael Steiner.

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Analysis for Austrian R&D policies, commissioned by the Federal Ministry of Science and Transport. Process Engineering Institute at Graz University of Technology.
Authors: Jürgen Jantschgi, Johannes Fresner, Hans Schnitzer.

All publications available at: PROJEKTFABRIK, Nedergasse 23, A-1190 Vienna, Austria.

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