

OPTIONS for strengthening interdisciplinary and transdisciplinary collaborative research: Concluding report; summary

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OPTI ONS f orst rengt hening int erdiscipl inary and ransdiscipl inary col l aborat ive research

Concl uding report : summary

Hel l mut l ange and Veronika Fuest

The f ol l owing ext represent st he f irst chapt er of a l onger, compl et e report . I t summarises t he cont ent of f our chapt ers preserving t he i r t hemat ic subst ruct ure. The compl et e report is avail abl e i n German f rom t he f ol l owing URL:

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OPTIONS for strengthening interdisciplinary and transdisciplinary collaborative research

Concluding report: summary

Hellmuth Lange and Veronika Fuest

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1 Programmatic framework and methodological coordinates of the report

Global Change Research and Sustainability Research in Germany have blossomed largely because of the funding policy of the BMBF. The Research for Sustainability (FONA) framework programme¹ illustrates the diversity and complexity of the topics which are now being covered by the BMBF funding policy on both the national and the international level. Collaborative projects with an interdisciplinary or transdisciplinary orientation² are the conceptual cornerstones of this funding. Projects of this type involve additional challenges compared to disciplinary research. This applies in particular to

- the collaboration with partners from a variety of academic disciplines ('interdisciplinary') and of non-academic partners ('transdisciplinary') and
- the project coordination as a management task
- working on longer time scales

All three tasks must be made to harmonise with the institutional latitudes, the training and career-related objectives and demands, and the practical routines which determine the day-to-day work of the actors involved in the projects.

The results of the BMBF-funded OPTIONEN ('OPTIONS') evaluation which are to be presented here relate to this range of problems. Three questions were pursued for four completed collaborative projects taken from those funded by the BMBF:

- Where were the strengths of these collaborative projects?
- Which bottlenecks and obstacles came to light when coping with the interdisciplinary and transdisciplinary objectives?
- How can these problems be approached in future projects?

All four projects dealt with aspects of climate change. They formed two pairs, each pair relating to comparable fields of natural processes³; two collaborations were purely German projects and two were international cooperation projects with partners in a total of four countries of the global South⁴. They were conceived at the end of the 1990s and work on them continued for a period of around ten years. During this

¹ http://www.fona.de/mediathek/pdf/bmbf_fona3_2016_englisch_barrierefrei.pdf

² Abbreviated as *ID/TD collaborations* below

³ For pragmatic reasons, this report uses the more general term 'natural processes'. It refers to various subsystems in nature whose 'ecosystem functions and services' are endangered or challenged through overexploitation or destabilisation in certain regions. During the period in question, only a small number of projects of a comparable size were undertaken in Germany in these particular thematic fields, hence it has not been possible to explicitly name the thematic fields while at the same time guaranteeing the necessary anonymity of the actors involved at the time.

⁴ Hereinafter abbreviated as countries of "the South".

period, almost 400 researchers in total and several hundred practitioners were involved.

The results to be presented here are based on the following investigative steps: (i) evaluation of relevant project documents, (ii) semi-structured interviews with people carrying out different functions in the projects, (iii) an electronic survey among junior researchers working on these projects, (iv) a series of expert workshops on those topics which the interviews showed to be of particular importance.

Due to the need to anonymise the strengths and weaknesses analysed their relevance cannot be recognized any longer on the single project level. As the reverse of the medal, this may look as though the problems discussed existed uniformly in each of the projects. Therefore, we want to stress that this is definitely not the case. There are significant differences in magnitude and character according to the subject matter, the natural and societal context and the individuals involved in each project. Since this type of differences is not at the centre of the present report rather than identifying options for avoiding and overcoming common problems, we found our way of anonymising the findings acceptable.

The most important findings are summarised here in three focal topics which supplement each other: *Products, Phases and Actors*.

The problems described are each linked to proposals ('Options'), which we think are helpful to avoid or at least reduce problems who have become obvious in comparable projects in the future.

Some of the 30 options presented here have already been proposed by other authors as well, sometimes even years ago, in a similar form. Today, more than 15 years after the call for applications and the drafting of the concept for the collaborations considered here, a number of recommendations have been taken up and implemented in the context of the FONA programmes. But to a large extent they are yet to be taken up or even acknowledged.

It is thus all the more laudable that the BMBF, the key actor in the field of large ID+TD collaborative projects, has seized the initiative in funding our study – and done this in the case of collaborative projects which it itself funds. We owe it our thanks and our respect.

The results of our study now provide a detailed empirical basis which confirms how much the ambitious objectives of ID/TD projects require a wealth of changes to established routines and structures – on the conceptual level as well as in the execution.

The analysis as well as the options stated here were made possible by the complete willingness to cooperate shown by members of literally all the groups of actors involved in the four projects considered. We owe them a very special thank-you. This applies even more since it is in the nature of such a study that – searching for

ways to improve the goal attainment – it reports mainly on things which need improvement. This means it is easy to lose sight of the successes achieved.

Here, as well, the finding that “context matters” obviously applies: what has been achieved in the four projects is, in many respects, the work of pioneers in developing a project type whose key features represented uncharted territory at the end of the 1990s – at least for environmental research and at that point in time. Those involved have taken up the challenges associated with this. With this in mind, the successes achieved count double, and omissions are only serious if they have been recognised and repeated nevertheless. This is the yardstick for future projects.

2 Products

The term *products* encompasses the following categories: (i) academic publications, (ii) publications for non-academic readers, (iii) academic infrastructures in partner countries, (iv) decision support systems (DSS). A further paragraph (v) relates to the forms of data management chosen.

From an overall perspective, it can be summarised that the goal attainment has obviously been most successful in the classical area of single-discipline academic research. The interdisciplinary and transdisciplinary objectives, in contrast, turned out to be the much greater challenges.

Academic publications

An examination of the papers in academic journals which were published and bibliometrically recorded between 2000 and 2010 confirms successful publication activity for all four collaborations

- by academics with an above-average publication rate with high citation rates exceeding the rates to be expected with the journal in question
- in journals cited with above-average frequency
- which have topical profiles of above-average breadth and in this spirit are relatively open to interdisciplinary perspectives
- with above-average international orientation⁵

⁵ The yardstick is the global average of the journals listed.

Overall, this meant that the researchers working on the projects were renowned in their own research fields. The bibliometric methods available (SCOPUS) cover only a selection of journals, and a corresponding fraction of the publications overall, however.

In two collaborations, *edited volumes* which address an academic readership are a further form of academic production. Here, the contributions follow a largely additive pattern; however: it has not yet been possible to identify an integration strategy directed towards interdisciplinarity.

Transnational groups of authors have been created only to a limited extent in the international collaborations.

Information about completed publications and the exchange of abstracts have taken place only on a very ad hoc basis among the members of the collaboration. Hardly any consideration was given to language barriers for the project members in the countries of the South.

Option 1: *Academic publications*

The collaborative partners should specify objectives, resources, rules and the intended procedures for compiling publications for the various academic and non-academic purposes and addressees as early as possible.

They should also draw up a concept for the exchange of academic information between the project partners, paying heed to the various academic partners as well as the non-academic partners which have contributed in one way or another to the success of academic analyses and the publications based thereon.

Publications for non-academic addressees

In line with expectations, publications directed at non-academic addressees were fewer in number than the academic publications. Hardly any consideration was given to differences in the interests and the educational backgrounds of different non-academic addressees.

So-called *project atlases* were drawn up in three cooperations. They are intended primarily for non-academic addressees, but are also valued in the academic sector in the context of the countries of the South. They collate key results from the sub-projects of the collaborations on a country-by-country basis into short overview articles to form systematic and historical inventories which provide a many-faceted illustration of the project findings on the particular collaboration topic.

The atlases have met with a very good response in the international cooperation projects in particular. In the partner countries, they are highly regarded as valuable contributions to discovering a national identity in terms of environment and sustainability: a hands-on research product - both inside and outside the academic sector.

In all three projects, the use of the atlases by practitioners in the cooperations seemed to be limited after the projects had finished – this was probably also due to the fact that the issues dealt with in the atlases were not coordinated early enough with those of the non-academic partners in the projects. Moreover, the sub-chapters of the atlases are sometimes written in a style which is difficult for non-academic readers to understand unless they are already familiar with the topic.

Option 2: Publications for non-academic addressees

Publications which address a non-academic public must be tailored as specifically as possible to the addressee. They should be coordinated with the analyses of institutions and actors required anyway and with the other sub-tasks of the project concept (particularly with their interdisciplinary and transdisciplinary objectives). The key points of a publication strategy should therefore already be formulated as part of the project proposal development.

Academic infrastructures in partner countries

Setting up infrastructures played hardly any role in purely German projects since suitable facilities and basic equipment were nearly always available to the researchers here. In countries of the global South, however, suitable infrastructural conditions have often first to be created, even if this means importing them into the partner countries and setting them up locally.

Buildings were constructed and equipped in both projects abroad:

- several research stations
- meteorological measurement networks
- a laboratory to be able to carry out on-site analyses
- natural history collections
- buildings or rooms to accommodate literature and collections, in one case an exhibition, and to keep them available for subsequent use (including one “information centre”)
- botanical gardens and fish ponds

The conclusion overall is that:

The building *infrastructure* created is largely still available, and it is used by the institutes in question for various academic purposes and sometimes for other purposes and by other actors. In this context, the institutions fulfil the tasks envisaged for them, but (i) sometimes in a relatively limited way or (ii) not to the extent envisaged due to insufficient funding for the planned functions. Where they are used as intended, this stands and falls with the personal commitment of individuals.

With reference to the *measurement networks*, it can be said that: the installations are mostly no longer used locally; most of them are either dismantled or they fall into disrepair and can no longer be used, due to insufficient personnel or financial resources.

The *laboratory* can use only the simpler part of its technical capabilities. The chemical reagents needed for more demanding analyses are not available. A lack of money means they cannot be procured. Income is seized by the higher authority.

The holdings of some academic *collections* are endangered due to limited storage and conservation possibilities with one exception.

Botanical gardens and fish ponds are sometimes creatively used for other purposes as well.

The findings show that when building infrastructure is erected and when it is equipped with instruments, it is often the case that too little attention is paid to the following issues:

- technical compatibility
- user-specific utilisation need
- the qualifications needed by local (academic and non-academic) actors so they can make adequate use of the equipment
- clarification of the question as to how the funding requirement for future use can be met

These findings suggest that more importance should be accorded to the following dimensions from the planning stage onwards.

Option 3: Infrastructures

Infrastructures: Regulatory dimensions according to tasks	
Tangible requirements	<ul style="list-style-type: none"> • Equipment • Supply of consumables • Technical maintenance during ongoing operation • Maintenance, spare parts from outside (in the country itself/from Germany)
Financial requirements	<ul style="list-style-type: none"> • Amount • Budget responsibility
Staff requirements	<ul style="list-style-type: none"> • Qualification, already obtained or to be achieved by training • Time budget • guards if necessary
Responsibility	<ul style="list-style-type: none"> • Analysis of institutions and actors, clarification of institutional integration / centralised and decentralised rights of use • Formulation of objectives and agreements • Implementation management

Regulatory dimensions according to type of infrastructure	
Buildings	<ul style="list-style-type: none"> • Specification of the tasks • Equipment • Maintenance • Management • Supervision
Technology	<ul style="list-style-type: none"> • System suitability • Handling during ongoing operation • Supply of consumables • Future maintenance and repair, spare parts from national or international sources

Decision Support Systems (DSS)

Decision Support Systems (DSS) comprise information systems or databases, models, hardware, software and websites. In project countries of the South, devices and media (data storage media, electronic hardware) and training courses have to be included to make the systems accessible and usable. The creation of DSS has proved to be particularly demanding in terms of content and organisation.

In the present case, their design and development primarily followed issues immanent to academia; when cooperating with non-academic partners a supply-oriented approach with appropriate top-down orientation predominated: as transfer of knowledge, methods, data records and models from academic research with a prior concept into non-academic domains. Issues of importance for particular practitioners have been included too late and too little from their point of view.

Limited experience with the requirements of DSS development in relation to process management, and insufficient incentives for effective stakeholder work were an additional hurdle to a target group-specific alignment of the research results. As a consequence, they were used only for a limited period, sporadically and selectively (data records). In this respect, the stated objectives of developing decision support systems for practical use were achieved only to a small extent, in our view.

In addition to the consistency of the models taken as the basis, and the technical operability of the 'tools', it proved important to clarify the social preconditions under which they are used. This was hampered by the fact that the developers had limited familiarity with the institutional and cultural 'landscape' in which the data would be used.

Option 4: *Co-Design*

Products to be produced jointly by researchers and practitioners have to be co-designed from the very start. If this is not the case, their practical use on completion is questionable.

To cope with tasks involving an interlinking of academic objectives and non-academic requirements, there must be

- a long-term concept,
- professional management,
- sufficiently specific preparations,
- more effective incentives for demand- and stakeholder-oriented academic work.

Option 5: Decision Support Systems (DSS)

In order for addressees to be able to use DSS in the long term, in the countries of the South in particular, but in the countries of the North as well in many respects, the following points must be clarified in advance:

- technical availability of the software and often the necessary hardware as well,
- sufficient training of the intended users to use the systems,
- taking into account the compatibility between the DSS-related work and the institutional scope and limits for action of the intended users,
- clarification of the access and disposition rights,
- clarification of the financial and staffing resources needed for updates and adaptive measures.

Data management

In the course of the projects, huge amounts of data were acquired by a large number of actors in very different domains. However, management concepts to ensure (i) the exchange and dissemination of data during the project period in the spirit of an interdisciplinary or transdisciplinary collaboration and (ii) long-term viable measures for sustainable data usability, lagged behind. An examination of how the data management requirements were handled showed there to be a gulf between the ambitious project objectives (ID and TD) on the one hand, and concrete experiences and possibilities for overcoming the associated challenges, on the other.

This concerns the assessment of the possibilities and limitations for using Internet platforms to ensure the broad accessibility of the data to be gathered and a high degree of interactivity when dealing with data, models and systems (DSS). Internet platforms and project-specific databases can serve the communication within the collaboration and the PR of the collaborations well. They are less suited to the sustainable archiving, continual updating and further use of data obtained by external users.

Sufficient infrastructural possibilities in a suitable institutional framework to set up forms of data archiving which are viable in the long term were not always available.

Option 6: *Data management*

- Within ID/TD projects there must always be particularly early agreement on the content, scope and format of the data required and the time when it is to be disseminated to other subprojects and partners. This process should therefore be made a key topic and regulated, not least taking into account the tasks and interests of the junior scientists as the most important data providers in projects of this type.
- The sustainable availability of the research data after a project has finished by anchoring it permanently with an institution should be made mandatory in the call for applications.
- An appropriate concept should be part of the project applications. It should contain an agreement with a data centre which is to be involved and, depending on the type and scope of the data, earmark funds and facilities for archiving the data. Projects should set up databases of their own only in exceptional circumstances with appropriate justification and success monitoring.
- The data should be computer readable, and, if available, archived in standardised formats. They must contain the metadata necessary to understand them and must be able to be cited.
- At the start of the project work, all sub-projects must be informed about the planned forms of data recording and archiving. The relevant obligations should be put into a contract.
- The basic data on which the publications are based should be made available as supplements.
- The full text of doctoral theses and monographs should be archived in the German National Library, the library of the federal state and (if there is one) in the institutional repository of the source institute. This should also apply to doctoral theses which were written in cooperating partner countries.

3 Phases

Interdisciplinarity and transdisciplinarity require syntheses which still play a subordinate role at best in daily university routines. They are constitutive for the type of collaborative project under debate here, however. Creating ID/TD syntheses requires the actors involved to have an above-average amount of experience and skill in the planning, management and administration of the associated tasks over all phases of the collaborative projects. It is not sufficient simply to develop the necessary concepts and take all the necessary decisions, they have to be taken at the right point in time as well.

A distinction can be made between *creation phase*, *execution phase*, and *transfer and perpetuation phase*. Although the transitions are fluid when preparing the intended products, each phase focuses on its own specific tasks.

Creation phase

ID and TD requirements can only be suitably taken into account in the course of the project when the necessary measures have already been taken in the creation phase, because decisions on important characteristics of the subsequent project architecture are already taken at this early stage. This means, however, that the tasks in the preparatory phase will also become much more complex than in conventional disciplinary projects and this will be the case in all 3 stages of the preparatory phase: *call for applications*, *submission of applications*, and *evaluation*.

Much more experience on this issue is meanwhile available from ID/TD projects than was available in the creation phase of the collaborations considered here at the end of the 1990s. In fact, the forms chosen with more recent funding are often those where more space is given to the complexity of the tasks to be dealt with in the application phase. The creation phase of larger collaborative projects must always be accorded much greater importance than was the case in the collaborations investigated.

Call for applications

In the case of the projects of interest here, a thematic framework and a project format deemed to be suitable are usually laid down in recursive processes between BMBF, project organisation and individual academics; the applicants then decide which specific topics they want to elaborate within this framework. The present case showed that the operational requirements placed on the concept development which resulted from the envisaged project format, had not been so clearly expressed in the call for applications as to provide sufficient specific guidance to the applicants. Given the then

novelty of the project format chosen for the groups of actors involved, this probably applied to the evaluators and project organisation as well.

Option 7: Call for applications

The operational requirements of the project format detailed in the call for applications should be stated in more concrete terms than was the case at that time. Special explanations should be required for this purpose (more details in Options 10 and 11). This is the only way for the applicants to receive guidance they can work with; and the only basis on which a decision can be made on the quality of the applications which is appropriate in this respect as well in the further course of the creation phase.

Project proposal development

The scope of the preparatory clarifications, which would already have been necessary to develop the project concepts, was often underestimated. The time allowed for submitting the application was also too short for the relevant clarifications to be dealt with during this time, however.

Two-stage application procedures should continue to be specified, comprising the submission of a brief *project outline* and a *definition phase*. But: (i) the duration of the application phase should be extended, (ii) the necessary funds should be available and the requirements for (iii) the description of the structure and process of the project proposed should be made more specific, as intended in Option 8.

Option 8: two-stage submission of applications

- A two-stage structure of the project proposal development, comprising an **outline phase** and a **definition phase** seems most appropriate. In order to develop its potential, modifications must be made to two aspects of the procedure which formed the basis at that time:
 - (i) The operational requirements of the project format as detailed in the call for applications should be stated in more concrete terms than was the case at that time.
 - (ii) The deadlines of the application procedure must be commensurate with the content required.

- A project topic shall be proposed in a brief project outline. It should be used to assess how worthwhile and challenging it is, from an academic-analytical perspective as well as how it aids the development of practical solutions for sustainability problems.
- The outline should provide information on the following issues in addition to a description of the basic idea of the content: planned objectives, methods, types of partner, financial framework and time-frames, intended products and previous experience of the applicants.
- The most plausible outlines should be selected and expanded to viable concepts in a definition phase.
- No more than six months should be allowed for drawing up the project outlines, depending on the size of the collaboration formats specified, and around one year for the definition phase. For the definition phase, it is imperative that sufficient funds are available for the coordination, expert opinions, travel and workshops, and for the mediation as well, where necessary.

Interdisciplinary project partners were sometimes recruited when the conceptual coordinates of collaborations had already been specified. This sometimes led to imbalances, not least in relation to partners from the social sciences.

Recruiting suitable practitioners was largely deemed to be difficult. Analyses of actors and institutions either did not take place or they were not sufficiently specific. The practitioners were often recruited and integrated too late for a viable co-design.

Option 9: Preparations for interdisciplinary and transdisciplinary workability

By the time the application is submitted, the relevant activities should have led to concrete results for the following issues:

Ensuring interdisciplinary plurality

- in accordance with the envisaged topical scope of the collaboration, in relation to natural sciences/social sciences as well,
- by systematic team development regarding objectives, management forms and project-relevant key terms of the disciplines involved.
- recruiting suitable practitioners/non-academic partners by making a start on analysing actors and institutions before shaping the project concept

- preparatory clarifications to attract non-academic key actors as advisors and stakeholders should already start before the final draft of the project concept is prepared.

Characteristic challenges of ID/TD collaborations were often dealt with only in the course of the project on an ad hoc basis and thus without sufficient conceptual preparation and under considerable pressures of time. This is certainly unavoidable in some cases. It is recommended all the more that the challenges which can be predicted with certainty be met as early as possible.

Option 10: *Sub-concepts as early as the definition phase*

for the following project areas:

- team building and the operational drafting of the project idea should be designed in two strands: as an interdisciplinary research-centred concept and as a transdisciplinary concept,
- as a management concept, particularly also with reference to the demands of interdisciplinarity and transdisciplinarity taking into account the relevant challenges of international cooperation projects,
- as a data management concept, as a training and communication concept for the different groups of academic and non-academic project actors.

With *international cooperation projects*: issues of financial responsibility created considerable problems in the day-to-day running of the international cooperation projects. Two issues represented a constant source of irritation, and all the more the later they were addressed:

- Which costs are borne in the partner country, by which institution, and for how long?
- Is the time and labour expended by the various project partners (different groups of practitioners, doctoral students, academic staff, professors) remunerated, and if so: how much is paid?

Option 11: *International cooperation projects require*

- concepts to prepare the German and foreign partners for the challenges of intercultural cooperation⁶,
- here, the use of expertise from development collaboration should become the norm in cooperations with the countries of the South,
- joint transnational planning and performance concepts,
- an agreement on the distribution of the financial responsibilities of the participating parties. It should also stipulate which institutions and persons are responsible for which cost areas.

Evaluation

Those responsible for the projects considered the evaluations to be sometimes too superficial and contradictory as far as expectations and decisions were concerned.

Option 12: *Differentiated evaluations*

- More attention should be paid to matching the experiential background and the judgement and advisory skills of the evaluators involved, not least with a view to the additional challenges which both academics and practitioners
- will have to face in the future according to our recommendations. Before the start of the evaluation and with reference to the fields distinguished in Options 8 - 11, there should be self-agreement on objectives and quality criteria: (i) between the evaluators and (ii) between evaluators and project organisations.
- The results of this process should be summarised as minutes in the form of criteria and brief explanations.
- More time should be spent on discussing and evaluating the applications, and the evaluation should be conducted on the basis of the minutes mentioned.

⁶ We draw your attention here to the Guide produced by the Swiss Committee for Research Partnerships with Developing Countries (KFPE 2012).

- In practice, clarification and consultative discussions between evaluators, project organisations and applicants have proven to be an important option. When deliberating the final applications after the definition phase, such an exchange even seems to be imperative and is being used in the BMBF context for some time.

Selection evaluations forego direct contact between evaluators and the key persons involved in the submission of an application to a greater or lesser extent. There is thus little scope for advising the applicants or persons responsible for the project. *Continuous consultative support* is deemed to be a form which can be helpful when developing the project proposal as well as during the course of the project: as a discursive process which aims to productively relate the expectations and experiences of both parties, and as a cooperative form of looking for a solution for problems identified.

Option 13: *Selection evaluation and advisory services*

- Selection evaluations should be supplemented by advisory services, particularly in order to clarify requirements developed in the call for application and the evaluation process. Moreover, clarification discussions and consultations between evaluators and project organisations on the one hand and applicants on the other can be helpful. Such a feedback process even seems to be imperative to deliberate the final applications after the definition phase.
- Experienced experts from the circle of evaluators together with persons responsible from the project organisations could also form a support group, or in this capacity act as mentors for each individual project funded.

Stress situations in the daily professional routine of the academic evaluators, which is primarily structured by their universities, encourage a discrepancy between the time budget of the evaluators and the requirements of a well-prepared and thorough consultation. This applies especially to the evaluation (and support) of large collaborations, which is already very time consuming. It applies all the more when the consultative support for the applicants or those responsible for the project is accorded more weight, as is proposed here.

Option 14: *Limits of honorary evaluations*

Given the effort necessary in terms of time and expertise, the conventional form of evaluation and project support on a purely honorary basis already seems to be no longer appropriate, at least in the case of large collaborative projects, and all the less so when the intensification of these activities is de facto necessary. They therefore require remuneration for the work to be performed or already performed, not least for pragmatic reasons: without such recognition, attracting sufficiently competent and experienced experts could also become more difficult in the future.

Execution phase

Dividing the funding period into 3-year phases appears to be too short given the complex requirements of ID/TD processes (see also doctoral students, Option 27). It was felt that the requisite re-applications and evaluations for the second and third project stages meant that this scheme was characterised too little by matters of content and too much by the formal requirements of the reporting system and the positive self-representation. Our discussion partners also pleaded for the funding phases to be made more flexible, depending on the tasks of the project concerned.

Option 15: Execution phase in two stages

In contrast to the three-year phases of the projects considered, it appears more favourable to divide up the execution phase into only two stages. These should be correspondingly longer: four to five years in the case of collaborations of the type considered. A milestone should be defined in the middle of each stage; an evaluation should take place between the two stages. The evaluation effort would thus be reduced, and the project work would become more settled.

The execution phase was characterised by a high degree of concentration on academic tasks from individual disciplines. All other tasks (ID and TD) were tackled with lower priority, and very often too late and without an adequate concept. This fact points to two things:

- to the degree to which the academics involved – be it voluntarily or forced by their professional circumstances – remained in the tradition of working within a single discipline and

- to the fact that the management of interdisciplinary and transdisciplinary processes represents a significant challenge for researchers, and the time provided to cope with this challenge was often not sufficient.

Option 16: *Project management as a separate module*

- Management work (collaboration management and sub-project management) should be designed as a separate management task in the form of a distinct module - in addition to the academic work in a discipline. It should include:
 - the formulation of separate sub-tasks and corresponding objectives,
 - the use of external expertise for special tasks,
 - provision of the funds required,
 - separate success criteria and suitable means of honouring commitment and successes.

This framework needs to be made more explicit in the important areas of project management such as: intra-project communication and team building, interdisciplinarity, transdisciplinarity and Public Relations work.

Option 17: *Intra-project communication and team building as*

- *inter-sectoral communication (horizontal)* with a view to creating interdisciplinary synthesis: become familiar with the persons involved and the special characteristics of the disciplines they represent in relation to issues and terminology and with reference to the goal of synthesis they jointly strive to achieve,
- *multi-level communication (vertical)* between status groups, between management groups and the 'shop floor' level, and between the operational levels: possibilities to introduce experiences and wishes of members at the lower levels at a higher level, and ways to ensure transparency in relation to subsequent steps, alternative scopes for action, and reasons for decisions taken,
- reservation of the necessary *time budget* for the persons responsible, in particular the managers and coordinators, and provision of funding for training measures and advice by external experts, if required.

Option 18: Specification and implementation of the sub-concepts

- The specification of the *interdisciplinarity concept* to be developed in the application phase should be largely concluded along a roadmap (which products, by which partner, in which steps, deadline?) during the first third of the total term.
- The same applies to the *transdisciplinarity concept*, but – given the necessity for preparatory work in the ID process – with a delay: *completion of the concept* before the intermediate evaluation and *implementation of the concept* after successful evaluation at the start of phase 2.
- In the course of the project work during the execution phase, the implementation of the *publication concepts* on both management levels (sub-projects and project overall) should be understood as a key task of the project management.
- For all sub-concepts/modules, people willing to bear the responsibility should be found, designated and remunerated appropriately.

The vast number of heterogeneous tasks which have to be done in parallel means that the execution phase is sometimes characterised by an incredibly frantic pace and ‘ad hoc’ decisions especially at the management and coordination level. The necessity to reapply for the projects in a 3-year cycle and the subsequent and often drastic conditions imposed by the evaluators aggravated the hectic operational pace instead of having coordinated planning (interweaving tasks within a single discipline with the objectives of ID and TD).

The problem represents, on the one hand, a significant strain on the project management and the coordinators. On the other hand, the preparation of the managers (managers of sub-projects and management of the collaboration) and the coordinators for the heterogeneity of the tasks to be solved turned out to be insufficient, and they often felt they were left alone with the difficulties which arose therefrom.

Transfer and perpetuation phase

Transfer and perpetuation turned out to be those tasks for which the necessary resources were lacking most towards the end of the collaborations: in terms of time, funding and the requisite special knowledge and experience - a late consequence of the fact that the important needs of successful transfer and perpetuation processes were often already underestimated in the process of developing the project proposal, and the requisite steps were started too late in the execution phase.

Even when the concept of transdisciplinarity has already been developed as part of the project application (see *Option 7*) and when the management 'picks up the ball' during the execution phase and is better placed to cope with the associated management tasks, there is a lot of evidence for understanding transfer and perpetuation – similar to the project proposal development – as a separate, complex range of tasks. Three factors in particular argue in favour of this:

- An abrupt end to any funding without a transition harbours the danger that valuable resources which have been invested lie fallow or are lost.
- Even if the steps which are possible and necessary in this context to draft objectives of practical relevance and implement them have already been tackled in the application phase and the execution phase, transdisciplinary objectives can usually be achieved only by gradually adapting worked-out solutions to the actual practical situation of the practitioners concerned. This primarily concerns tools for supporting decision-making and training courses for using the tools.
- Moreover, how successful the solutions found and products worked out turn out to be in practice can often only be assessed over a longer period - and improved afterwards, if necessary.

None of these tasks can be coped with in a short-term tour-de-force. They additionally require staffing constellations which differ from those of the earlier phases:

- Far fewer people are required than during the execution phase, but compared to the execution phase, the ratio of academics to practitioners shifts towards the latter.
- The amount of work decreases gradually, but timewise it is periodic rather than continuous, and the remaining academics now have to collaborate predominantly with non-academic partners of different levels of education, specialisms and hierarchical levels.

Option 19: More weight for the transfer and perpetuation phase

- Our findings speak in favour of taking into account the particular requirements of transfer and perpetuation as well by designing an additional transfer and perpetuation phase and supporting it accordingly.
- Given the specifics of the tasks to be mastered, it is recommended that the management structure be adapted: as a restructuring of the management responsibilities by strengthening the role of transfer experts and expert practitioners. The aim would be for a small number of people to support the process. The group should contain academics and practitioners, in countries of the South a person from developmental collaboration as well, and the must be familiar with the preceding process.

- However, there should be advance clarification of how far the responsibility of the project academics should reach into the transfer and perpetuation process, which specific tasks they should take over here, and for which tasks other actors are better suited, for which they should therefore bear partial responsibility or even the sole responsibility. When specifying the tasks, a budget and its funding should be specified as well.

There is still a lack of systematic and publicly accessible evaluations of how well the completed projects of the type investigated attained their objectives. The evaluations undertaken by the funding institutions themselves remain confidential for good reasons, not least from the important point of view of preserving the anonymity of the project members involved as far as possible. Our impression is that, in the context of BMBF collaborations, the small number of publicly available evaluations of project experiences - mainly from smaller ID/TD projects and by quite different experts – were not afforded much attention by the actors typically involved (project organisations, evaluators, applicants). These actors often do not even know about them.

Option 20: *Ex-post evaluations as the rule*

Evaluations should become an integral part of collaborative projects. This process should also include the swapping of experiences with representatives of the various groups of project participants. Their main task should be the appreciation of progress achieved, the identification of weaknesses and the drawing up of proposals for setting up future projects, and this in all three dimensions: single discipline, interdisciplinary and transdisciplinary. The results should be available to subsequent applicants and projects in a suitable form.

Phase structure old and new

Figures 1 and 2 illustrate the difference between the phase structure of the collaborations considered and the changes which are recommended for future collaborations of comparable size in this regard.

Figure 1: Phase structure of the collaborations investigated (old)

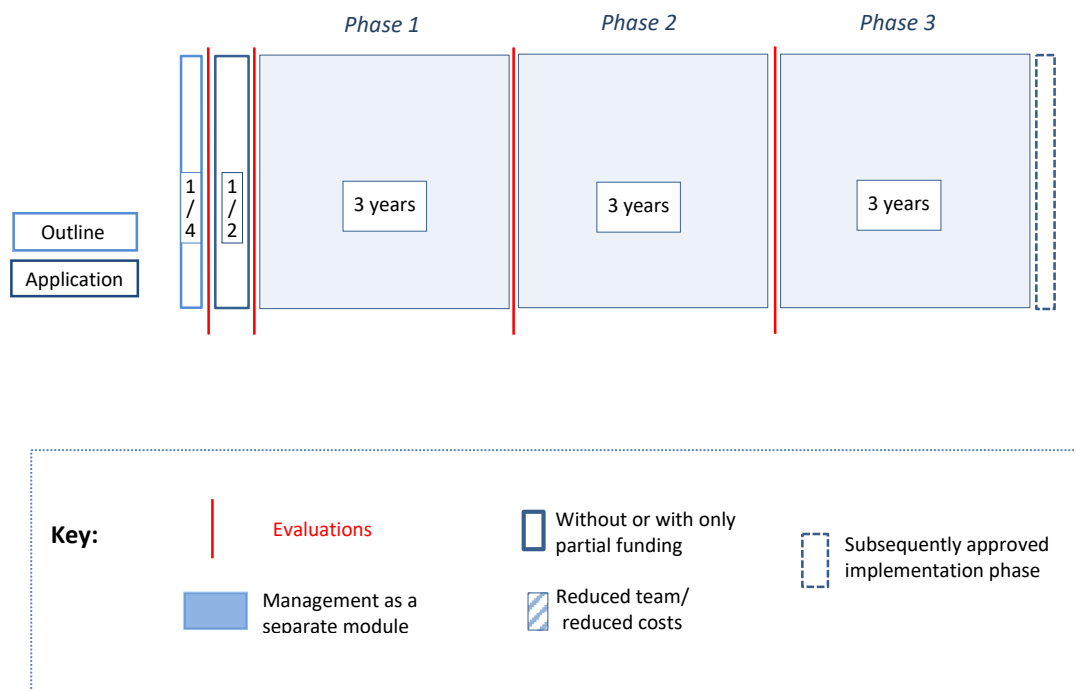
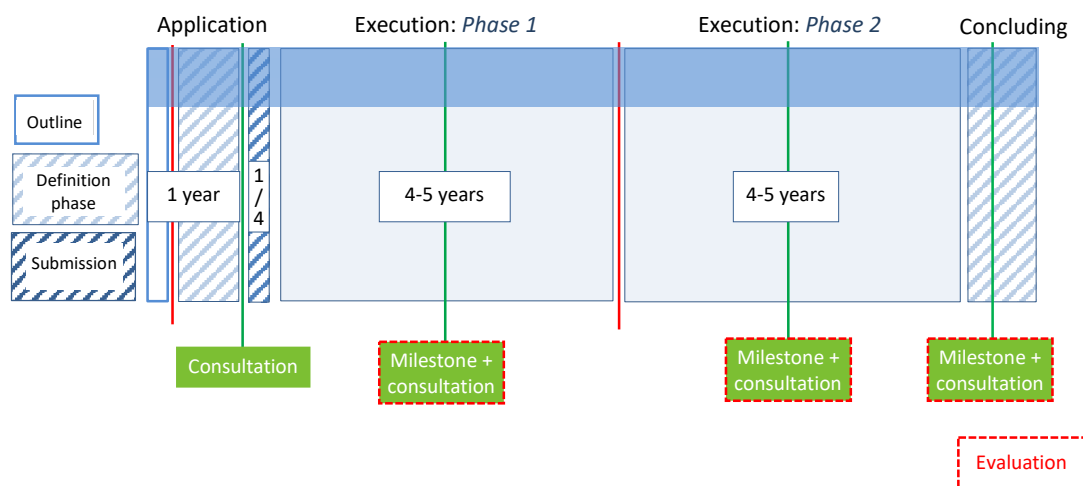


Figure 2: Proposal for a change to the phase structure (new)



4 Actors

In collaborative projects, the tasks arising are processed mainly by members of four groups with different qualifications: (i) **Professors** as managers of collaborative projects (*project managers*) and as *managers of sub-projects*, (ii) **postdoctoral researchers** (hereinafter abbreviated to 'postdocs') as *project coordinators*, as *sub-project managers* and as *research group managers*, (iii) **doctoral students** and (iv) **practitioners**, the latter mainly in state administrations on the national, regional and municipal level.

Project manager

The management of collaborations undoubtedly requires experience and skills in coping with management tasks which are as far removed from the average daily routine of a professor as they can conceivably be. Correspondingly large are *the* specific challenges of the management of project collaborations in the areas of management of interdisciplinary and transdisciplinary processes and personnel management, conflict management and intermediation. In the projects considered, we could see hardly any specific preparations of the project managers for these challenges or any significant professional measures to support them during the course of the project and to sufficiently relieve them of the other tasks undertaken by professors at their universities.

Under these circumstances, 'learning by doing' became the dominant source for the experience required to master the management tasks. This means that many possibilities which could 'actually' have been used to reduce unavoidable costs and other deficiencies in this procedure thus remained unused. This is difficult to understand and clearly counterproductive for collaborative projects of the type of complexity under discussion here.

Option 21: Management of large collaborations

The management of large collaborations requires recognition of the fact that the management work is a challenge in its own right in addition to the academic work in one's own field by (i) providing appropriate scope in respect of time and funding (ii) financial recognition of commitment and success.

- In order to be able to appropriately master the tasks involved in collaboration management, professors must be largely relieved of their other ex officio tasks. The provision of funds to finance a visiting professor or a deputising lecturer appears to be the most sensible solution.

In addition, support is required from:

- a managerial body for tasks of strategic importance for the project with appropriate representation of the most important groups of actors in the collaboration,
- coordinators and further experts (e.g. in data management),
- preparatory information and training courses relating to project management, interdisciplinarity and stakeholder work,
- consultants in the areas of project management, team building, management of stakeholder processes and mediation, as and when required.
- In addition, consideration should be given as to whether it is worthwhile dividing up the work within the management of collaborations: dividing it into academic and administrative responsibility. Administrative managers must have in-depth experience and inside knowledge of the academic operations, however. They could be found among (older) professors as well as appropriately trained postdoctoral students (hereinafter abbreviated to postdocs).

Professors

Given the range of tasks undertaken by professors in their daily professional routine – in addition to lecturing, administration, publications, talks and work as evaluators, and quite often responsibility as project or sub-project manager in further projects, which therefore need to be dealt with in parallel - it is obvious that only a limited amount of time remains for work in the collaborative project. The reasons for this are to be found on the one hand in personal decisions; but no less important are supra-individual circumstances in the form of institutionally anchored expectations of the science system, not least with indirect and direct consequential effects for the potentialities and limits of established professional career patterns. Against this background, the design and management of interdisciplinary cooperations represent non-trivial additional demands. Both of these apply to a still greater degree to transdisciplinary cooperations.

It is therefore not surprising that the large variety of tasks and expectations mean that disagreements have repeatedly arisen, despite broad acceptance in principle, as to

what is reasonable in terms of the discipline, timing or in other ways. This applies in general to the large number of project meetings in interdisciplinary and trans-disciplinary collaborative projects and especially in international cooperation projects. Apart from individual levels of tolerance, these disagreements also bring to light structural challenges of ID/TD collaborations which demand constructive solutions. This applies all the more where professors take on responsibility in a number of different collaborative or mono-disciplinary projects.

Option 22: Sub-project managers

- Professors should be able to concentrate as much as possible on their core competence as academic research manager in their discipline. Sub-project managers should also be required to be prepared to meet the interdisciplinary and transdisciplinary challenges *of the projects concerned*, however.
- It can make sense for professors to participate in several IT/TD collaborations as sub-project manager. This requires justification, however, due to the many associated obligations, and requires sufficiently clear coordination and obligations.
- For the variety of the resulting tasks, sub-project managers require professional support through training courses in the areas of project management, conflict management and intermediation - in countries of the South with additional emphases being placed on communication and regional studies.

Since the support and qualification possibilities listed in *Option 23* were not provided as part of the projects, the pragmatic alternative in the collaborations consisted in transferring a considerable number of sub-tasks to postdocs, and to a lesser extent to doctoral students as well. This practice frequently seems to have led less to a solution and more to a shift of the overload problems to the members of these groups.

Academic partners in the countries of the South

In the countries of the South, it sometimes turned out to be very difficult to involve sufficiently qualified academic partners. Suitable partners were frequently overrun with requests from other research funding providers and withdrew from the cooperation if they were not sufficiently involved in the design and funding. It sometimes transpired that well-qualified partners could cope only with a light workload, because they were often involved in several projects.

The limited level of education and the shortage of resources, especially in the tertiary education sector, meant that having the German side take on the academic leadership, which had been envisaged anyway, seemed the most rational course of action. Local

academics were incorporated mainly (i) for reasons of application strategy, (ii) due to a need for practical logistical support and (iii) to establish necessary contacts to practitioners in the countries where the research was being undertaken. Even academic partners acknowledged to have an above-average level of competence and experience played a part in developing research topics only at a very late stage of the project, if at all.

Where a cooperation ultimately did ensue, the project budgets generally provided too few funds for local scientists, whose low salaries meant they were usually dependent on ancillary earnings and where research projects always depended on external sources. German institutional funding modalities meant that expense allowances or daily rates were sometimes well below the internationally usual level.

Local academic partners additionally lacked access to research results during and after the project. Despite there being a great deal of interest in the German projects, these circumstances reduced the willingness to collaborate and sometimes led to very draining misunderstandings.

Where, in contrast, local academics were entrusted with responsible tasks and resources, a very productive commitment resulted from which the whole project benefited.

Overall, we felt both sides lacked knowledge of the socio-economic conditions, institutional restrictions and incentive systems in the academic sector of the partner countries.

Option 23: *Academic partners in the countries of the global South*

In international cooperation projects with countries of the global South, the following applies: asymmetries are an unavoidable fact, but their negative effects can be reduced.

- The joint specification of research issues, approaches and methods is a first important step towards more equality, jointly borne responsibility and mutual trust (KFPE 2012).
- The following measures at least appear to be necessary not only to avoid “extractivist” research and to allow academic partners in countries of the South to participate fairly: (i) substantial and early involvement in setting the agenda, (ii) sufficient provision of resources for an academic participation and (iii) a strategy to communicate academic results of the collaborations. From the point of view of sustainability as well, local academics should be integrated effectively.

- Institutional restrictions on both sides and divergent interests should be discussed at an early stage. The expansion of specialist competence and of international academic networks represents an investment in future international research partner-ships.
- Contacts should be established with those experts whose experience centres on research policy issues of participation and transfer.

Coordinators

Coordinators had to work on their own research topics at the same time as carrying out this function.

It seems to be no exaggeration that especially those coordinators working on this and similar projects for many years were able to become allrounders in sustainability research in the course of their work by having both these two main strands to their work. In fact, during the past fifteen years, a pool of corresponding experts has been created, not least as part of the collaborations considered here. Their experiences form a specific resource which should be used in a targeted way for future projects.

However, the diverse nature and heterogeneity of the coordination tasks led to the coordinators having less and less time for their own academic work the longer the project took. Under such framework conditions, it becomes very difficult to keep up with the knowledge in their own academic specialisation. Since, on the other hand, experience in demanding project coordination has so far hardly offered its own professional prospects – at the universities in particular there are generally very few possibilities for permanent employment for postdocs nowadays – deciding to take over ‘full-time’ coordination tasks threatens to become a route to a professional no-man’s land for postdocs.

Option 24: *Coordinators*

- Positions for coordinators in comparable collaborative projects should be subject to calls for application. The requested qualification of people envisaged for the posts should be detailed in the management concept of the project applications.

- In addition to the coordination function, no parallel academic qualification should usually be required. Exceptions appear to be sensible only if the time required for the coordination function can be clearly limited accordingly. Like sub-project managers (Option 23) coordinators require appropriate preparation for their tasks. This applies even more to those 'new to the job'. The particular demands of the work abroad have to be taken into account as well here.
- Even if the persons earmarked already have experience in project coordination, like professorial managers they require similar forms of further training and support during their work.
- Their fields of responsibility and decision-making authorities should be identified and clearly communicated.
- Above and beyond the project concerned, coordinators require vocational training-oriented advice and support, if they want to further pursue the specialisation they have de facto started on their own initiative – as a contribution to stabilizing a new occupational specialisation in the making.
- Corresponding qualification measures could also take place as part of the staff development at the universities - possibly supported by funding from the federal employment agency and not least by the project lump sum as well. Here mixed financing from BMBF funds and university funds can be considered as well, as was proposed by the Wissenschaftsrat and the German Rectors' Conference (HRK) ⁷.
- This also involves the option of freelance consulting work through corresponding further training options, establishment of a central database with providers of external support by the project organisation.
- The coordination experience obtained in the collaborative projects represents a valuable asset for further collaborative projects as well. The BMBF should therefore make institutional efforts to introduce the problem into the ever-livelier research policy debate on the promotion of junior academics after their doctoral studies, and on academic career paths as an alternative to a professorship, to support concrete options for a solution which can be recommended to future applicants.

⁷ On prospects for a professional stabilisation of postdocs in the future, see the most recent documents of the German Wissenschaftsrat and the German Rectors' Conference on career objectives and career paths of young academics after their doctoral studies and as an alternative to a professorship (2014).

Postdocs

In addition to their own research and sometimes as sub-project managers as well, postdocs were integrated into 'conventional' activities such as the development of research applications and the drawing up of reports, into academic lecturing in Germany and abroad, and into the supervision of junior researchers. In addition, postdocs worked on the organisation of interdisciplinary and transdisciplinary collaborations. They usually have more practical experience in research and a broader overview of the discipline than doctoral students. Some thus acted in various ways as champions of intra-project objectives. Such achievements and skills in particular seem to have hardly any effect on professional advancement towards a professorship, however.

Those postdocs who do not pursue an academic career towards a professorship therefore require vocational training-oriented advice and support above and beyond the project concerned in line with the statements of the Wissenschaftsrat and the HRK. As has already been proposed for coordinators, corresponding qualification measures could take place as part of the staff development at the universities.

The opportunities for being involved in important decision-making situations did not correspond to the postdocs' overview of their discipline and their broad insight into project processes in all projects. A hierarchical form of project organisation and the structural dependence of the junior academics on their professorial managers as far as employment and academic career were concerned sometimes led to valuable troves of knowledge not being used by the project management.

Option 25: Postdocs

- As far as possible, the 'Postdoc option' should be used much more frequently than to date when staffing ID/TD collaborations. Compared to doctoral students in particular, postdocs usually have a broader overview of their discipline and more professional experience. The comparatively higher salary of postdocs would be a good investment especially in sustainability research.
- Postdocs should be represented in the decision-making bodies of the projects, even if they do not manage any sub-projects.

The following forms of support are deemed to be imperative, however:

- To begin with, it is a matter of fairness to discuss the 'on the one hand, on the other hand' of the work envisaged which is outlined here and its possible professional consequences with the persons concerned at an early stage.

- If they decide in favour of the work envisaged, the following applies: Like sub-project managers, they also require an appropriate preparation for their tasks especially when ‘new to the job’.
- Even if they already have experience from a previous project, they require appropriate forms of further training and support for the new project.
- They also require vocational training-oriented advice and support above and beyond the project concerned in line with the statements of the German Wissenschaftsrat and the HRK, if they want to further pursue the specialisation they have de facto started on their own initiative.

Doctoral students

Doctoral students from Germany

Doctoral projects are now the most frequent form of third party funding-based project work at the universities by far, not least because doctoral students incur only a fraction of the costs of a postdoc. This fact is also the reason for the role of doctoral students as the dominant type of researcher in collaborative projects with ID+TD relevance – with the associated problems for the doctoral students as the typical result.

Doctoral projects make sense for *disciplinary* research tasks aiming to obtain new explanations. Doctoral students usually do not have the necessary breadth of specialist overview for *ID topics*. For *TD topics* this often applies in relation to the practical experience required. This is true even more in the countries of the South.

This is not contradicted by the fact that individual doctoral students – on their own account and/or expressly encouraged by ‘their’ professors – have undertaken TD tasks with a great deal of commitment and considerable success. Especially where such work has been done, allowances have to be made for the fact that it is foreseeable that this is to the detriment of the limited time budget and the associated financial budget which is usually planned for doctoral work.

Furthermore, in collaborative projects, the progress of the work in sub-projects (into which the doctoral projects are integrated) is often connected with the progress of work in other sub-projects and sometimes even depends on the latter. This is thus a further reason why limiting the funding of doctoral work in ID/TD collaborative projects to 3 years is often counterproductive. The findings from our survey of doctoral students point this out: more than one third needed more than four years to complete their doctorate, almost 90% needed more than three years.

Option 26 Doctoral students in/from Germany

- Funding of 4-5 years duration in total should be assumed to be the time-frame which is required when working on a corresponding doctoral topic as part of interdisciplinary or transdisciplinary collaborations. The formation of autonomous groups of doctoral students as a medium of swapping experiences should be supported.
- Interdisciplinary and transdisciplinary tasks should not be transferred to doctoral students as a rule.
- If they want to participate in these tasks, they should be made aware of the risks involved for the time budget and the financial budget of their doctoral projects.
- Involvement in transdisciplinary issues can undoubtedly also bring qualifications and experience which are helpful for the subsequent professional development outside academic research. En route there, the doctoral work remains the bottleneck which has first to be negotiated. An experienced person as mentor could help to keep an eye on both aspects here.

Doctoral students from/in countries of the global South

The training of doctoral students is academic routine in Germany, and now more than ever it is a mainstay of research and its institutions. The training of doctoral students in the countries of the South is, to a greater degree, also the prerequisite for academic institution building and the form this takes.

In the international collaborations, the outcome of the training of doctoral students in the partner countries also differs greatly from country to country: from 'hardly started' to 'quite successful'.

Where viable contacts already existed between the German project partners and university researchers in the partner countries, considerable success was achieved in the course of the project even under very difficult circumstances: doctoral students became postdocs; they took over teaching duties, and some of them were already appointed professors in the final phase of the project term as well. The latter, in particular, play an important role in enabling existing or newly created research programmes and institutions to acquire a clear profile in their countries and regions above and beyond the life of the initial projects, and not least those with German

funding as well. Meanwhile, the next generation of postdocs has already followed in their footsteps.

From this point of view, the training of doctoral students has made a significant contribution to the project objective of creating academic institutions in the partner country. In cases where it was not possible to build on tried and tested cooperation relationships from previous projects, no academic institutions formed.

Option 27: Doctoral students from/in countries of the South

In countries of the South, German academics should find it easier to realise *academic* capacity building (to promote persons and institutional developments) than *transdisciplinary* activities. The prerequisites are suitable prior experience and viable personal contacts, however, in both the academic as well as the even more difficult non-academic area.

Here, much is to be said for not approaching transdisciplinary objectives directly, but preferably in a second step: after academic relationships and common ground have been established, and with the work shared between the academic partners and institutions concerned in the country itself.

Non-academic partnerships

The term non-academic partners/practitioners means actors from *state administrations* at different levels (national, regional, local) and different specialisms relating to specific natural processes, *NGOs, action groups and companies*. The first mentioned carried the greatest weight in the four collaborative projects.

As partners of the academic actors, these ‘practitioners’ differ in one common aspect despite all internal differences: while academics are primarily interested in theory-related explanatory knowledge which is as general as possible, of primary importance for the practitioners is specific practical knowledge which is as case-related as possible. Although there is no antagonistic conflict between the two knowledge forms in the practical reality of the project, there is more likely a range of different mixture ratios of the two. Despite this restriction, both forms of knowledge do require at least partially different action strategies.

The challenge for transdisciplinary collaborations consists in narrowing down those issues which provide *academic and non-academic actors* with a sufficiently interesting *mix* of the knowledge forms of primary relevance for them. The extent of this area varies according to thematic fields, the actors involved and social contexts, and neither party can extrapolate it *ex ante*. The collaborations considered show clearly that linear ‘transfer strategies’ (first academic formulation and solving of the problem without

agreeing the content with suitable representatives of the practitioners, then transfer of the solution found to various practitioners) do not result in sufficiently adaptable solutions. Instead, this procedure leads to dissatisfaction, if not even rejection on the part of the practitioners – in Germany hardly less so than in the partner countries of the South.

Prior contacts have turned out to be favourable if they have already led to trust structures in the course of earlier professional relationships which make it possible to quickly come ‘to the point’. Ultimately unavoidable misunderstandings and mistakes in the conduct of negotiations are less problematic here. If this prior experience does not exist, it should be developed in the definition phase at the latest (see Option 9).

It is well known that *administrations* work in a more formalised and hierarchically more differentiated way than academic institutions, and cooperations with academic projects only ever form a small proportion of the tasks of cooperation partners in administrations. Staff changes harbour the risk that the agreement achieved cannot be renewed or that the topic is completely sidelined.

In these cases, problems arise through the fact that members of different social sub-systems meet who are only partly familiar with the institutionally specified scope for action and procedures in the other area: The specific work and discussion cultures in academia remain unfamiliar and sometimes strange for cooperation partners from other sections of society. Conversely, academics often lack the necessary understanding for the rules of administrative processes. This leads to irritations, misunderstandings and rejections, which can make the cooperation very difficult.

Option 28: *Non-academic partners in Germany*

- Intersections which are sufficiently attractive for both parties become noticeable only in a discursive way. A corresponding process must already be initially concluded in the definition phase of the project.
- More specific offers can usually be developed only on the basis of existing prior contacts between the persons carrying out the negotiations. Project concepts with a transdisciplinary design without any prior contacts in relation to their content are therefore particularly risky, especially in international collaborations.
- Especially for constellations where coordination processes between the two sides have to be undertaken in a larger group, it can be helpful to assign the task to experienced intermediaries.

- In each case, the challenge the projects had to get to grips with consists in balancing their contacts between politics and administration and between management level and operational level – and to repeatedly re-ensure the viability of the modalities found at intervals.
- Giving consideration to this problem at an early stage, including providing appropriate resources for analyses and communicative processes, can at least bring about a reduction in the sources of friction. This contact must be designed on the one hand, to be open for any result. On the other hand, it must start with an offer which is sufficiently clear and appealing for the practitioners.
- The model for funding academic positions in the practitioners' organisations is promising, but requires careful preparation and coordination.
- Given a minimum degree of mutual understanding and a readiness to work together, it can also be fruitful to have representatives of the practitioners in the group of applicants.

The following applies to all challenges discussed above in relation to practitioners: they present themselves *in German and in non-European contexts*, in the latter often in a particularly drastic form, however.

In the *partner countries of the South*, practitioners acted as data providers (in particular centralised authorities, development organisations), as project supporters in the research region (decentralized authorities, development aid workers), as hosting municipalities and as recipients of data and DSS (centralized and sometimes decentralized authorities), depending on the situation. In the international collaborations investigated, it was the exception for actors from politics, industry, administration or civil society to be involved in planning the project content and the project execution. Many members of these groups felt this was a disadvantage.

The diversity of the practitioners in respect of specialisations and areas of responsibility would have required a more differentiated approach, especially if several partner countries are involved. We have found only few examples for this, however. The necessary understanding of the problem was sometimes lacking, as were the time resources and the financial resources as well.

If one disregards the gratitude towards individual junior academics, who took it upon themselves to forge links to development aid, the widely held hopes of practitioners that the projects would be directed towards development aid or have an impact here remained largely unfulfilled.

Option 29: *Non-academic partners in the countries of the South*

- An early and thorough stakeholder analysis in relation to the project topic planned and correspondingly differentiated communication strategies are indispensable, as are knowledge of the country and a minimum command of the lingua franca of the country concerned.
- Initial *contacts to relevant stakeholders in academia and administration* must already have been established at the start of the project. It can make sense to establish the *contacts in two steps: first* in the academic area, *afterwards* in the administrative area with the aid of an academic mediator.
- Immediately after the project begins at the latest, the contacts in both areas – unless already developed - must include *both the operational level as well as the management level of the state side*.
- As a possible cooperation partner in partner countries of the global South, the Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ) should be contacted at a very early stage as well. If thematically sensible, *someone from the GIZ* should be involved *as an expert*, not least to be prepared for an active role in the transfer and perpetuation phase.
- And finally, the project management should inform the *German embassy* in the host countries about planned collaborations.

Summary Actors

Our findings on the sub-topic ‘actors’ can be summarised as follows: the *division of tasks between the* members of the *groups of actors*, especially between the different academic groups, has been a source of considerable problems and this has made it difficult to achieve the project objectives set, both ID and TD. In our view, the fundamental mechanism consists in the fact that the placing of too many demands on office-holders together with limited available resources have led to tasks either not being taken up or passed on to project members lower down the hierarchy. In consequence, this led to new overloads and too many demands being placed again. This situation affected the quality of both the interdisciplinary formation of a synthesis, and the transdisciplinary cooperation and its results.

Option 30: *New division of tasks or smaller cooperations*

The essence of the alternative is therefore: In order to improve the goal attainment of the projects and to relieve the actors involved, there either has to be a *significant change in how the work is divided up* among the members of the four academic groups and further experts have to be involved, or the *complexity of the collaborations should be significantly reduced*.

5 Summary of the options for action

For collaborative projects of comparable size and complexity, the following **10 points** represent key challenges:

1. Two-stage project proposal development as co-design (natural and social sciences, theory and practice) over a period of at least one year and design of a separate transfer and perpetuation phase with a financial budget, appropriate management structure and a duration commensurate with the topic.
2. Development of the evaluation system by intensifying the internal communication in the evaluation process and expanding advisory services for collaborations.
3. Detailed consideration of the particular management requirements in project proposal development, in setting up and executing the project, and in the transfer and perpetuation of project results.
4. Give due consideration to sufficient financial resources and individual time budgets for coping with the complex challenges of managing interdisciplinary and transdisciplinary collaborative projects.
5. Designing special management concepts for the fields of activity
 - a. team building and communication,
 - b. creation of an interdisciplinary synthesis,
 - c. transdisciplinary collaborative objectives,
 - d. data management and publications.
6. Improving the performance of project managers and coordinators through tailor-made qualification measures, provision of consultancy and effective performance incentives with the aim of making the project management more professional.
7. No overloading of the postdocs' field of activity with coordination tasks involving responsibility in addition to their own academic research. For those who decide to professionalise as coordinators, additional measures to support this option as part of a vocational academic perspective as an alternative to pursuing the path to a professorship (as proposed by the Wissenschaftsrat).

- 8.** Give due consideration to the specific academic training tasks and the prevailing time and financial restrictions on doctoral students in respect of the requirements of interdisciplinary syntheses and transdisciplinary cooperation processes.
- 9.** Early qualified preparation of German members of the project for the special requirements of collaborative projects where the foci lie in countries of the global South, as well as and by involving external expertise.
- 10.** If there is no noteworthy progress with points 1 to 10, the following applies henceforth: smaller and less complex collaborations!