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Dr Viola Peter (Project manager)

Judith Vermeer

Dr Paresa Markianidou

Chiel Scholten

Geert van der Veen

Stijn Zegel

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About this evaluation

This report summarises the results of the evaluation of the research and service activities of the Royal Belgian Meteorological Institute (KMI-IRM, in the report abbreviated with RMIB - Royal Meteorological Institute of Belgium). Commissioned by the Belgian Federal Science Policy Office (BELSPO), the evaluation was performed by a team of consultants from Technopolis Group in the period October 2015 - June 2016. The purpose of the evaluation is to support RMIB in the development and determination of its research strategy. RMIB is one of the ten Federal Scientific Institutes (FSIs) that are evaluated in order to optimise the quality and relevance of the research efforts and to increase the national and international visibility of the FSIs.

The report is based on the results of desk study, interviews with RMIB staff and external stakeholders, a staff survey, case studies, an international benchmark analysis, bibliometric analysis, a self-assessment and a peer review.

Context of the Federal Scientific Institutes

Belgium is a federal state with three regions in which BELSPO is responsible for coordinating science policy at the federal level. Among BELSPO's tasks are the design and implementation of research programmes and networks and the supports of ten Federal Scientific Institutes (FSIs).

The FSIs of BELSPO have a two-fold mission:

- Performing research: performing fundamental and applied research.
- Delivering scientific public services (including museum activities, collection conservation and policy support).

The FSIs receive structural funding from BELSPO, which consists of a general dotation and funding for part of the FSIs personnel. The current federal government (established in October 2014) has announced and already implemented a number of changes in its science policy. Four main changes are related to or will have an impact on the FSIs:

- general austerity measures and budget cuts, which result in budget reductions for FSIs and for BELSPO's research funding schemes;
- integration of BELSPO into another government department;
- an increase in the autonomy of the FSIs;
- creation of a Belgian Space Agency.

Since the FSIs are part of the federal government, they have to follow the rules for federal organisations. As most rules are designed for government administrations and not for scientific institutes, the administrative burden is relatively high for FSIs. FSIs function under a number of limitations such as:

- limited opportunities to apply for regional funding (e.g. from FWO, FNRS). This is only possible through collaboration with universities,
- no possibility to recruit PhD students independently of universities;
- limited financial autonomy;
- limited recruitment autonomy.

Within the last couple of years FSIs were asked to modernise and optimise their management, their organisation and their services in order to be better positioned in the Belgian, European and international research area, to contribute to the international reputation of Belgium, and to link with

other federated entities. In addition, a commercial logic is little by little imposed to the FSIs, asking them to increase their other income as part of their budgets as well as for an economic impact. However, regulation does not determine whether the services provided by the FSIs to external partners are free or need to be paid for. Although the government announced changes that will increase the FSIs autonomy, these changes have not been implemented yet.

Mission and activities of RMIB

The Royal Meteorological Institute of Belgium is a public research institute under the auspices of BELSPO. The institute was founded in 1913 and recently celebrated its 100 anniversary.¹ The present organisational structure has its roots in the 1950s. Together with the two other 'Space' FSIs, it is mainly located in Uccle/Ukkel, in the region of Brussels.

The **mission** of the Institute is to *“provide reliable services to the public and the government based on research, innovation, and continuity”*. Thus, RMIB is first and foremost a mission-oriented Institute. While the institute is known by most people in Belgium for its weather forecasts, the institute is involved in a much broader range of activities such as gathering, checking and archiving meteorological and geophysical data, managing the infrastructure needed for this, developing models and conducting scientific research. The research conducted principally focuses on developing weather models and providing weather forecasts to the public and specific client groups, and on developing observation capabilities. Thus, the research and the services are closely interlinked.

The **activities** are structured in so-called 'Operational departments' (OD). Since 2015, the Institute is structured in six departments. One of them is located in Dourbes (southern Belgium), the others are in Uccle/Ukkel. The different departments (with their numbering) focus on:

- Meteorological and climatological information (OD1) and research (OD2);
- Geomagnetism and ionospheres (located in Dourbes) (OD3);
- Observations (OD4);
- Weather forecasts (OD6).

Furthermore, there is the 'Information processing and IT support' (OD5) service which provides support to the operational and scientific activities of the institute.

Governance and management

RMIB is an independently managed public institution. The institute nevertheless functions at arms length from BELSPO. BELSPO is not only the main budget source but a rather tight **governance** structure can be seen. The most obvious may be when it comes to the appointment of a director, which is the privilege of the State. But also in general recruitment and promotion of statutory personnel, which is decided by a jury, the hierarchy is given with the state chairing the jury. Compared to other international public research organisations, this is a rather top-down governance model with limited autonomy at institutional level.

In terms of **management**, the institute has been managed by an ad interim Director General for the past five years. This somewhat undecided situation seems to hamper any longer-term decision making and strategic developments. This situation is considered by many interviewed researchers as inappropriate and as hampering the scientific development of the institute. However, other FSIs being in the same situation have been less cautious and made strategic plans and decisions.

The geographical distance of the department in Dourbes to the rest of the RMIB in Uccle/Ukkel is felt by the researchers there. In their view, they are not included much in decision-making which takes place in Uccle/Ukkel. The 'status quo' of the Dourbes department is simply maintained while it was felt that there are more developments possible.

¹ The front picture takes note of this important date: Belgium dedicated a special €2 coin for its commemoration.

Strategic developments

The **absence of a strategy** at the institute level has been seen by the peer reviewers as a major constraint for the further development of RMIB. The peer panel suggested that the institute's potential in research is greater than its present performance, also due to the lack of an institute-wide strategy and the limited interaction between departments.

So far, RMIB departments formulate research topics they are following or envisaging. These topics have by and large 'organically grown', based on the scientists' knowledge and capacities. There are annual management meetings when the Directory Council and key members of the institute meet. Topics such as the overall direction of the institute and the work plan for the next year are discussed. However, a clear strategy covering research and service strategies, internal and external communication, as well as human resources is seen as a cornerstone for the development and positioning of the RMIB.

Internal communication and collaboration

Based on the interviews with RMIB employees, the quality of **internal communication and collaboration** is perceived rather mixed. The perceptions depend strongly on personal experiences of the staff. While some staff members were satisfied with the internal collaboration, others felt that there was room for improvement. Often a positive perception is connected to age and length of the service. Persons that see room for improvement indicated that the interaction between departments was ad hoc in nature and dependant on personal connections. A lack in communication was also confirmed during the peer review. Here, the communication related also to inter- and intra-departmental missed opportunities as well as a lack of communication between hierarchies. The peer report suggests that communication is addressed in an overall strategy of the institute. There are several opportunities to foster formal and informal communication, be it a summer barbecue, a Christmas party, a Ph.D day, brownbag lunches etc. In order to stimulate better communication and fostering internal collaboration, it is either necessary that the management addresses it top down, or that it welcomes and encourages bottom-up initiatives.

A rather particular situation occurs to the service in Dourbes. There is limited communication and practically no collaboration with the other operational departments of the RMIB in Uccle/Ukkel. Instead, the Dourbes department has strong external collaborations with universities but also with the other Space institutes in Uccle/Ukkel.

External Cooperation

Scientific cooperation takes mainly part with public research organisations. The cooperation with private organisations is linked to the services function of the institute.

Geographically, the most important external partners are located in Belgium and France, followed by Germany and the Netherlands. According to the staff survey, about half of the respondents find it easy or very easy to access appropriate partners for their work while 41% were neutral about finding partners. A small proportion of the people (13%) find it difficult to very difficult to access appropriate partners.

Several respondents indicated they have close relationships with most (potential) collaboration partners. The field is rather limited so that potential collaboration partners are known but the choice is equally limited. It was also mentioned that BELSPO helped to connect to universities and companies, while EU COST actions helped finding international partners.

Whether the cooperation has a research or service direction depends on the operational department. The more research intensive ones such as in climate change collaborate with academic partners while the more service oriented departments cooperate with other meteorological institutes and clients.

Among the main academic collaboration partners were national universities such as the Catholic University in Leuven and the Catholic University in Louvain-la-Neuve. In terms of international academic institutions, they are mainly located in France, the UK, the US, and Germany.

Collaboration with other meteorological institutes happens as well. RMIB is involved in several initiatives, for example one initiated by the World Meteorological Organisation (WMO) which aims to standardise and harmonise observation data, warning reports, etc. and to facilitate the exchange of information between countries. Collaboration was mainly seen as positive – in particular when it is for research – but staff also raised concerns concerning a potential decline of the marked share due to expanding foreign meteorological services.

Surprisingly little to no collaboration exists with the two other Uccle/Ukkel FSIs. The peer review notes that *“outside of the STCE programme for solar research (...), very little collaboration exists between the Uccle/Ukkel Institutes (although e.g. they all are active in satellite missions and all three are active in space weather). This suggests there is an urgent need for a joint discussion on the long-term strategy and management plan of these three entities.”* Collaboration with the other FSIs is happening at a rather limited scale and only when BELSPO funding is available. The peers also mentioned that among the FSIs new avenues for collaboration should be explored – even if they are thematically divers – there are common questions and challenges. They do however actively share part of the infrastructure such as computer, security etc.

Funding

Between 2008 and 2015, the overall budget grew by 3.4% on average annually. The research income has seen the largest growth with 7.8%. The income from scientific services is the smallest source of income and lost in terms of absolute significance (6.6% in 2015 – down from 7.4% in 2008). In 2015 the RMIB budget amounted to €13.1m. More than 60% is national public funding in form of institutional funding (BELSPO general donation and staff envelope) as well as BELSPO research programmes. An important – and somewhat threatening factor is an expected decline of public funding.

The strong dependence on BELSPO funding was addressed and alternatives discussed. In particular funding from services seems to be underdeveloped. While RMIB offers a number of interesting services, in practice, however, it proves difficult to significantly increase the institute's income via these services. According to the peer review, the decline is by and large caused by the strategy of the institute to replace short-term service contracts with long-term cooperation contracts. While this leads to more stability, it is also leading to a lower operating margin. The low service share is also partly related to the fact that there are a number of competitors on the market offering the same kind of services. External interviewees mentioned that the institute has difficulties to 'grab opportunities' and develop specific products. New service opportunities seem to freeze at a very early discussion point with no further advance. The very slow uptake of ideas and actions was also mentioned as a barrier for reaching out to private sector companies who buy information. In this respect a private competitor 'Meteoservices' acts much faster and is often addressed instead of RMIB – even if the data is of less good quality.

A much smaller share of funding concerns EU funding. It has gained in significance but it is still limited. The peer review suggested that RMIB could take better advantage of EU opportunities – beyond the current level. A pre-condition seems however more cooperation with foreign universities in order to succeed in European research funding.

Human resources

By the time of the evaluation, RMIB has a total of 191 staff members. 38% are scientists, 8% scientific support and the remaining 54% is non-scientific support. The number of total staff has decreased since 2008 on average annually by 4%. While the number of contractual scientists increased, non-scientific support staff declined markedly. This results in an overall growing share of scientific staff. Staff is

predominantly male, in particular the scientists, and many have been employed in the institute for years and years.

The departments differ in terms of size as well as funding structure. The 'Observations' (OD4) is the largest department in terms of overall staff while 'Meteorological and climatological research' (OD2) has the highest share of scientists. OD1 is the only department with a major share of service-related income while OD4 acquires a significant share of the research income of the institute.

According to the staff survey, with 60%, the majority of time is spent on performing research and 12% on providing services to external customers. Less than 5% of time is spent on general public engagement, providing internal services, or teaching at higher education institutions.

Interviewees mentioned that the available human resources in the institute can maintain the necessary meteorological functions, but everything 'on top of this' is happening with additional effort. The peer review thought that a reorganisation of the departments into services and research strands would be benefitting and create additionalities due to a better use of and communication among the staff.

Given the slightly declining funding, an increase of staff is unlikely. Reorganisation – also taking into account the research and (to a lesser extent) the services of the two other Uccle/Ukkel-based FSIs, could be challenging but possibly unleash new opportunities and lead to synergies.

Scientific contributions

The research undertaken at RMIB has various outputs in term of scientific publications, datasets, scientific instruments, and models. Despite the lack of an overall research strategy and in spite of a number of bureaucratic and financial constraints, the **scientific output** as measured only by articles is rather small but is growing over time. In 2014, there were about 30 scientific articles. The peer review concluded that overall the research performance is considered good - bearing in mind the small size of the teams involved – but the research potential is greater than the present performance, partly due to the lack of an institute-wide strategy. Interviews with external stakeholders also suggested that while the amount of (basic) research conducted by RMIB is limited, the research that is carried out is generally of good quality.

The reception of RMIBs publications by the academic community can be analysed through citation and publication patterns. While there are positive developments, there is clearly room for improvement: by increasing the publication outputs, visibility tends to increase as well – and if the outcomes are of good quality, they will obtain citations. So far, the number of publications of the institute has not reached yet a 'the critical mass' which needed to be more visible in the wider scientific community.

In comparison to benchmark institutes, the research outputs are lower and they are also less visible and thus cited. RMIB staff produced 0.16 publications on average compared to 0.36 (both FMI and KNMI). In terms of publications per scientist, the ratios were KNMI: 1.1, FMI: 0.7 and RMIB: 0.5.

Services

Public service provision is at the heart of RMIB. Some two million people receive weather forecasts (partly or entirely) supplied by RMIB every day by way of television or radio, and more than 200.000 people visit the website every day. Indirectly even more people receive a weather forecast based on RMIB data. In this way RMIB reaches a larger audience than any other FSI.

The service income of RMIB is, with 6,5% of total income, only a limited part of RMIB income, but the services provided have a significant social value (esp. warnings for extreme weather) and, sometimes, commercial value (e.g. in planning electricity capacity).

So far, the services provide only limited income: would and could the RMIB be 'more aggressive' and behave more like a commercial entity? More value added services can be developed – in particular if organisational changes are realised and internal communication and cooperation are improved. But this also has implications on the market.

The Belgian Open Data Policy might have a significant impact on the RMIBs business models concerning its service provisions. Clarity on the implementation of the Belgian Open Data policy in relation to the data generated by RMIB should be obtained as soon as possible, and well in advance of the actual implementation of the policy so that RMIB can prepare for implementation. RMIB should be compensated for the loss of income that may result as a consequence of further implementation of the Open Data policy.

Impacts

There are clear social, economic, and environmental impacts on the broader public as well as agriculture and industry sectors. They all benefit from accurate and timely weather forecasts and early warnings about precipitation and extreme weather. Direct impacts to the broader public in adjusting to the predicted weather has a rather daily impact: for example, people get warnings due to heavy rainfall on a highway and are required to slow down, thus reducing accidents. Energy, transport, or agriculture are other sectors which are deeply affected. Energy companies can plan ahead for adjusting their grids for example when heavy winds are expected, and better absorb the surplus from wind energy. There are numerous examples when behavioural change due to the weather conditions are economically and environmentally significant. The benefit can likely to be calculated when unexpected changes cannot or only be communicated late: the damage costs of accidents, casualties, or crop failures are measured for example by insurance companies and/or private sector firms. Given Belgium still enjoys a rather stable weather (no major earthquakes, flooding, tornados, etc.) the average consumer may not consider the impacts of extreme weather conditions. If however currently unpredictable local thunderstorms lead to casualties (like in the case of 2011 Pukkelpop festival in Hasselt), the general public is reminded about direct impacts of sudden weather changes and appreciates research for better modelling.

Recommendations

The main recommendation is rather broad and has implications on most aspects relevant to RMIB. It concerns the development of an institute-wide strategy which tackles: organisation, internal communication, long-term research strategy, and a long-term business strategy based on value-added services. These pillars are mostly interlinked. They will influence each other and leverage different outcomes. Despite the fact of having 'only' an ad-interim Director, the management needs to develop an ambitious strategy for the institute. It could do so top-down but also in a more bottom-up approach. Using the ideas of more people than just a few leading ones, may result in innovative ideas and be easier to implement.

Below, the key reflections for each pillar:

Organisation

Reorganisation of the RMIB according to two strands could be envisaged, namely service-related activities in one and research-related ones in the other one.

- It is vital that the departments interact more and take advantage of synergies;
- The “Geophysical Centre of Dourbes” is somewhat disparate from the rest of the institute, its activities are more related to the two other Uccle/Ukkel-based FSIs. A wider reorganisation might be useful.

Internal communication

Internal communication should be improved. Communication seems to stop mainly at department level, while communication between departments would stimulate cooperation benefitting both services and research performed. Therefore formal and informal activities are suggested that stimulate better communication and information flows and – once they become a habit and will be quasi institutionalised, create synergies (informal get together, Ph.D. day, brownbag lunches etc.).

Internal communication between hierarchies could also be improved. This requires a less top down approach - or a transparent top-down approach where information is not only selectively diffused top

down, but where formalised opportunities exist that empower also young and/or contractual staff to voice ideas and suggestions.

Long-term research strategy

The institute is relatively small – in particular in terms of the research side. So far, the compartmentalisation of the research in several departments seems sub-optimal. Critical mass is needed to be internationally visible in fields such as climate change or space weather; otherwise the institute will remain in its small niche. Given the limited number of researchers, a focus on a limited number of selected topics would be useful. For deciding, not only the currently available personnel should be the basis for the decision, but also international trends and a realistic SWOT would be needed. For some areas, an aligned research strategy with the two other FSIs in Uccle/Ukkel may already provide for more critical mass. In order to be visible to the outside scientific community, a better ‘branding’ is needed which means first and foremost to publish under one common institutional main affiliation name. This concerns RMIB and in particular the Dourbes department, but it also applies to the three Uccle/Ukkel FSIs.

technopolis |group| The Netherlands
Spuistraat 283
1012 VR Amsterdam
The Netherlands
T +31 20 535 2244
F +31 20 428 9656
E info.nl@technopolis-group.com
www.technopolis-group.com

