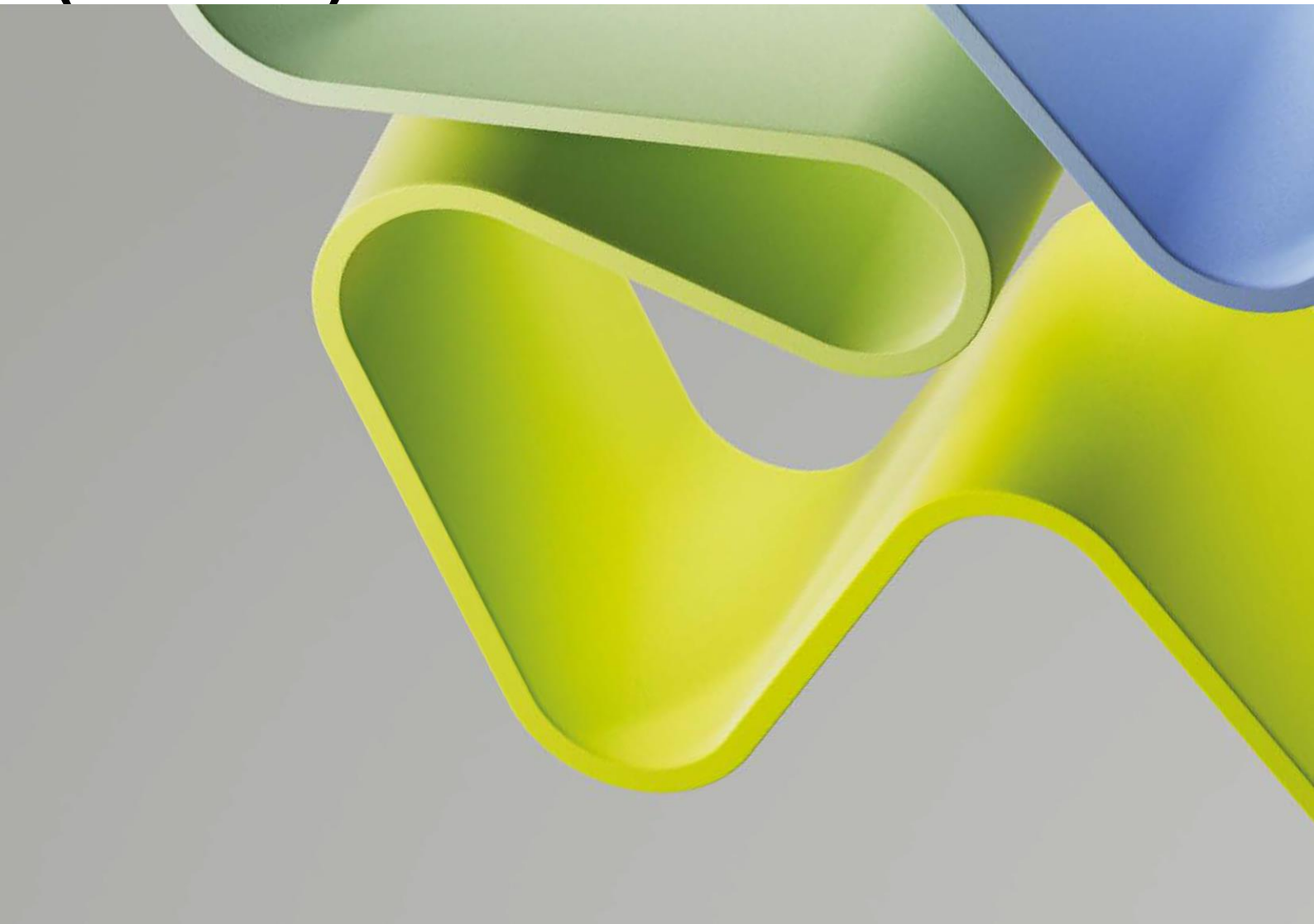


# Evaluation of the Fire Research and Innovation Centre (FRIC)



**Expert Panel**

Grunde Jomaas, Professor, Slovenian National Building and Civil Engineering Institute (ZAG) (chair)

Erna Danielsson, Professor, Mittuniversitetet Sverige

Dag Botnen, Chief Fire Officer, Haugaland Brann og Redning iks

**Support Panel**

Andrea Lucherini, Dr, Slovenian National Building and Civil Engineering Institute (ZAG)

The evaluation meeting (online on MS Teams) of the Fire Research and Innovation Centre (FRIC) in Trondheim, Norway took place on November 4, 2022. The members of the evaluation team were Professor and FRISSBE ERA Chair holder Grunde Jomaas (Chair), Professor Erna Danielsson and Dag Botnen as subject area experts. Dr Andrea Lucherini attended as observer and by taking minutes. The committee would like to thank members of FRIC, RISE FR, SINTEF, NTNU, PhD students, partner organisations, and the Research Council of Norway (RCN) team (Line Marie Sørdsdal and Berit Berg Tjørhom) for their support with and contribution to the evaluation process and the provision of written materials.

Overall, the evaluation meeting confirmed that FRIC is doing very well, and in fact significantly better than what could be read from the written material. The following will provide observations from the written documents, online material, and the evaluation meeting, along with recommendations for how FRIC can perform even better in the future.

## **Background**

In 2016, as part of Det Store Brannløftet, the Research Council of Norway was commissioned by The Gjensidige Foundation to carry out a state-of-the-art review of the research related to fire safety in Norway, and to advise the foundation on designing an R&D effort to generate new knowledge about fire prevention and preparedness. The state-of-the-art report stated that the fire safety research field in Norway was poorly developed, and that the research community was fragmented. In summary, a need to generate and disseminate knowledge was highlighted, and key challenges included establishing predictability, long-term funding, scientific vigour, and cooperation.

To address these shortcomings, FRIC - Fire Research and Innovation Centre - was established in the spring of 2019, based on a national, competitive tender organized by RCN. The research centre is financed through NOK 30 million from The Gjensidige Foundation (BRANNSIKKERHET), 'gaveforsterkelse' (which was an arrangement for supplementary funding from the Ministry of Education and Research that could be awarded for privately funded research (that is no longer available)), as well as a contribution from the Ministry of Justice and Public Security. The initiative is organized by RCN. FRIC also has its own funding from the three research partners RISE FR, NTNU and SINTEF, and from 18 partners from public and private enterprises. The total budget for FRIC is thus well over NOK 70 million spread over five years. The focus of the research is to develop a better basis for knowledge-based decisions and solutions within the area of fire safety. There are 4 Work Packages (WPs) in FRIC with a total of 12 projects, and these include, among other things, residential fire safety, fire-safe use of wood in buildings, better solutions for extinguishing fires, and fire safety in connection with new technology for the production and storage of energy in buildings. How we can learn from fires - and thus prevent similar incidents - is also an important topic. Central to the work are fire prevention, fire safety for risk groups, development of sustainable solutions, and dissemination of knowledge to a wide range of target groups.

## **Organisation and management, partners, and funding**

As a result of small and fragmented R&D environment in Norway there were expectations from the Gjensidige Foundation that the funding would provide relevant research within fire

safety. It was therefore decided that establishing a centre was essential, as this should be a place where fire research organization, individuals and partners could meet. The centre should be organized in a way that research could create new research and thus lead to research growth beyond the initial funding. Finally, the goal with the funding of a centre was that it eventually should be able to stand on its own without further fundings from the Gjensidige Foundation.

Furthermore, a centre under the BRANNSIKKERHET initiative should bring together national and international actors and lay the foundation for high-calibre research that enhances competence-building, increases the dissemination of knowledge, and expands capacity. This should in turn promote more knowledge-based practice in the fire safety field and facilitate innovation among private and public stakeholders. The participation of industry, firefighting services and/or other fire safety actors in the public sector was therefore anticipated. The initiative placed particular emphasis on participation by companies within the industry, but other parts of the business community could have roles to play as well. There were high expectations for user involvement and for the benefit of the research to society.

FRIC is hosted by RISE FR and has about 2 full-time-equivalents distributed to 13 researchers (of which 13 has a PhD) from RISE FR, SINTEF and NTNU. Apart from the FRIC director, Anne Steen-Hansen, who has a 50 percent position, most have 10-20 percent engagements with FRIC. For these 13 researchers, the gender balance criterion is achieved well-beyond the required criterion. The breadth of their expertise is also commended. In addition to the researchers, FRIC also has a Board and many in-kind hours contributed by the different partners.

FRIC has done an impressive job with respect to support, both in-kind hours and direct financial contributions, from a large number of partners. These partners are also from an impressive range of sectors, including consultancy companies, construction product manufacturers and public sector organizations. Some of these partners are also international. All these contributions have made the financial size and the partner reach of FRIC beyond expectation, and this is commended. This achievement clearly shows that there is enormous potential for a national centre related to fire safety science and engineering, and the relevance and need for such a centre were echoed by all stakeholders throughout the evaluation meeting.

An essential aspect that was identified through reading of the written material was that it was not clear to any of the evaluation committee members whether FRIC was indeed a centre or merely a project at RISE FR. That is, it was unclear if there was a physical centre, a clear identity and a possibility to carry out research beyond the predefined WPs. During the evaluation, it became quite clear that FRIC was generally seen as a large project with sub-projects. This has possibly resulted in too rigid project thinking with focus on delivering WPs and sub-WPs (as expressed by several partners), rather than establishing a centre of excellence for knowledge generation and exchange and ensuring the longevity of a national centre. The latter is what everyone is saying is key, but the work is carried out in a way that makes it appear that delivering WPs and sub-WPs is most important.

The lack of a proper centre with a clear identity is seen as a critical weakness that needs to be addressed immediately in order to ensure longevity of FRIC. This should probably include a physical place where visitors to the centre can be welcomed and gather, and potentially a reconsideration of the current organisational structure. FRIC should then also be in an excellent position to be branded even stronger (website, social media, affiliation in publications, use of templates for and logos in presentations, and so on).

Thus, FRIC must take a decision what FRIC wants to be in the future. FRIC as a project delivering research regarding an application within a project period gives few incentives for further funding beyond the project period. FRIC should therefore have two parallel tracks, namely one that ensures high-level research output and another that establishes a strategi/plan for a sustainable centre in the long term. Without such an approach, it is likely that FRIC ends after the funding period and the Norwegian fire research community returns to where it was before FRIC was established.

**Recommendation 1:** A clearer profile as a national centre is deemed as a necessity, which should involve a place to physically meet and where guests can be hosted any given day. It appears natural that such a physical centre is located at RISE FR, as long as a clear identity is established, including a mapping on the organizational chart. It might also be of value to have a full-time centre leader, who can completely embody the centre identity, but it is emphasized that this has nothing to do with the quality of the work that the current FRIC director does, as this work is deemed to be excellent. A true centre that is visible on the organizational structure of RISE FR is also essential, because research projects end, while centres (can) live on.

**Recommendation 2:** In order to confirm that FRIC is truly a centre, a financial model that allows FRIC to generate income and potentially grow in size and establish itself as a permanent centre should be created. This could, for example, include the possibility for partners to earmark future funding towards positions in FRIC. Also, research income from new grants should ideally also have certain amounts and positions reserved for FRIC, as opposed to only being for RISE FR, SINTEF and NTNU (e.g., new projects like SafeBESS and TREEADS could perhaps had financial input to FRIC). Finally, given how much praise RISE FR, SINTEF and NTNU gave to FRIC and how strongly they stated that FRIC was important for them, it could be perceived that required funding for some of the FTEs needed could also come from internal funds.

### **Research activity**

From the onset, the primary objective of the initiative by the Gjensidige Foundation was to develop a dynamic, interdisciplinary research and innovation centre that can provide a long-term contribution to more effective and knowledge-based fire safety efforts.

Towards this end, FRIC has organized their research activities into four Work Packages (WPs), each of which has several projects:

- WP1 Evidence-based decision-making within fire safety (2 projects)
- WP2 Fire Dynamics and modelling (3 projects)
- WP3 Building technology and design (3 projects)
- WP4 Fire safety measures, new technology in buildings (4 projects)

FRIC has produced valuable research and the work on learning from fires, battery fires, timber fire dynamics, photovoltaic fire safety and fire safety in waste facilities have international visibility as well as national importance.

Dissemination is a central aspect of modern research, and FRIC has been active in conferences, social media, physical and online meetings and in media and other fora. This has resulted in 8 open reports, 29 conference articles, 40 public presentations, 13 public webinars, 8 workshops, 52 mass media articles, 2 book chapters, 1 bachelor thesis, 11

master thesis reports. The breath of the activity is impressive and shows that FRIC strives to reach different audiences and has established themselves to be a source of valuable fire safety knowledge.

With respect to more academic publishing, FRIC has only reported 5 journal papers so far, which is below expectation for the volume of research the researchers are involved in (that has yielded 12 thesis reports and 29 conference articles). In the evaluation meeting, it was communicated that several papers are in the pipeline so that next year will result in a boost in the publication record, and this is welcomed. When looking into the publication record in more detail, a clear omission is detected in that most of the published papers do not have any stated affiliation to FRIC, although FRIC is acknowledged as a funding source. This is quite likely linked to the general observation that FRIC is generally seen as a large project rather than a centre.

A clear strength of FRIC is the collaboration between NTNU, SINTEF and RISE FR that it has fostered. The evaluation meeting made it very clear that there are many mutual benefits from this, and that the collaboration is highly appreciated and valued by the researchers involved. All three institutions were adamant that FRIC had played a central role in many of their successes in the past years, such as securing research grants, attracting new research partners, and increased visibility. It should be noted that this became much clearer based on the evaluation meeting, which means that there is room for improvement in the clarity and completeness of reporting (for example in annual reports, which appeared minimal at times) and in online material such as links between websites and more aligned websites for FRIC at the different institutions.

**Recommendation 3:** FRIC could benefit from having a more focused research profile, which potentially means stopping some activities and closer discussion with partners/externals on what to prioritize. As the current WPs have a total of 12 tasks, one could argue that FRIC has 12 research areas today, which should be easy to reduce with time. In the process of moving from a WP-based organization to a centre with focus areas, FRIC could both focus their research profile and widen those areas that will add to the center's development. It is foreseen that this can increase the international visibility of FRIC, as they can then become known for their expertise on certain topics. Fire dynamics and safety of batteries, photovoltaic systems and timber appear to be of high relevance at the moment. Although the grant necessarily is linked to the Work Packages in the proposal, it could be beneficial (for strengthened centre identity) to establish and use (Research) Focus Areas in communication where it is not strictly required to use the Work Package terminology.

**Recommendation 4:** FRIC should increase their journal publishing rate and make sure that all publications have FRIC as an author affiliation. As FRIC should be a centre with a place in the organizational map, it would be natural to use 'FRIC, RISE FR'. The researchers external to RISE FR would thus have 2 affiliations (FRIC, RISE FR and SINTEF/NTNU). Some of this increase could potentially come from closer evaluation of which papers at SINTEF, RISE FR and NTNU that should be associated with FRIC. Keep in mind that having two affiliations are also common. In addition, mechanisms that ensure conversion of conference contributions and thesis reports into journal papers should be established. In other words, this means that a publishing culture and protocol appears to be a priority of value for FRIC.

### **Innovation and benefit to society**

FRIC develops knowledge of benefit to user organisations in the field of fire safety and contributes to the development of more knowledge-based practices in the fire and rescue service. In particular, the

fire service expressed great satisfaction with FRIC and the collaboration and learning opportunities associated with FRIC.

FRIC collaborates with business-sector stakeholders in carrying out R&D activities, and particularly construction product companies and public sector institutions used the evaluation meeting to communicate that they had benefitted from their collaboration with FRIC. Due to COVID, some initiatives have been delayed, but are now progressing well. The benefits could be improved through closer collaboration and improved communication (both ways), particularly with respect to research directions that could be of direct value for fire safety engineers in consultancy companies.

As fire is a phenomenon that has higher risk for certain segments of society, it would be of value for FRIC to consider how they can establish projects that are both developed and carried out in close cooperation with relevant user interest groups. To achieve a proper status as a national centre, it is then also expected that FRIC actively works to disseminate research results to broad-based user groups and the public at large, and with a specific focus on targeting at-risk users.

**Recommendation 5:** Ideally, the knowledge that FRIC develops and the interaction that FRIC can offer for stakeholders, and particularly the fire services, should be beyond Trondheim. Again, this falls under the key observation of the need of truly acting as a national centre. Thus, FRIC should come up with a strategy/plan for how they can truly become and be a national centre that benefits an even wider part of society.

**Recommendation 6:** If possible, FRIC should address societal needs at a national level and receive national and international recognition through dissemination of the results in order to connect the results to FRIC. In order for this to be measured, there is an important need to establish a clear procedure for how to recognize the value and impact of FRIC. The measures could, for example, be related to more followers on LinkedIn, more publications, more workshops arranged, higher number of citations, and increased number of visitors. It is also essential to show the FRIC logo to make FRIC more visible when presenting at meetings, workshops, and conferences, nationally as well as internationally (even if it also says RISE or SINTEF). If FRIC truly intends to become known as The Fire Research and Innovation Centre in Norway and internationally, it must be more visible.

### **Internationalisation**

With regards to the internationalization of Norwegian research, it is important to bear in mind that COVID has had a significant influence on this aspect of the evaluation. Since FRIC commenced, RISE FR has attracted and hired several international researchers with a PhD. However, the evaluation committee members wonder if these new employments and resources are mainly benefitting FRIC or RISE FR. In addition, even when COVID is accounted for, international mobility of outstanding international researchers (incoming and outgoing) has been lower than expected.

The research activities carried out by FRIC have fostered many interactions and collaborations with research and industrial partners at Norwegian and international level. The established successful collaborations have created a prolific environment which has offered exceptional resources, expertise, services, and skilled feedback to research

activities. However, the centre is not fully internationally recognised yet, and this aspect is something to work on. In the evaluation committee's opinion, the international recognition is also linked to the FRIC visibility and identity. As a national centre of excellence, FRIC should create a unique and clear FRIC branding. This can be achieved in numerous ways, starting from all dissemination and communication activities. For instance, some of the PhD students did not explicitly mention the FRIC affiliation in their presentations and/or use the FRIC logo and templates. Social media interactions and posts can also raise the FRIC visibility. In addition, the FRIC website should also be improved and constantly updated, in alignment with the websites of the FRIC core partners.

**Recommendation 7:** They are not yet internationally recognized (as FRIC), and this is something to work on. The visibility could be improved, and some of this could be easily solved with a clearer identity and improved reporting and dissemination/communication practice.

**Recommendation 8:** RISE FR and FRIC should continue to hire international researchers with a PhD, and ideally one of these should be well-recognized internationally based on his/her research achievements. Along with a more distinct research profile, this has clear potential for increased international recognition of FRIC. This is obviously a long-term goal, so in the remainder of the current funding period, increased international mobility to FRIC (guest researchers and visitors) should be the focus.

### **Researcher training and recruitment**

It appears obvious that there is a link between FRIC and the overall growth of RISE FR in the last years. This is another element that supports the importance of nurturing the FRIC identity.

FRIC is associated with several new PhD students (5 in total), which substantially increases the number of PhD students focused on fire safety in Norway. This is a significant improvement compared to the lower numbers of PhD students within RISE FR in the previous decade and provides excellent promises for the future, as a larger PhD cohort facilitates research-focused discussions and knowledge exchange. This is a clear benefit to fire safety engineering in Norway, as well as it improves the experience, education, and competence of the PhD students within FRIC. In the evaluation meeting, the PhD students highlighted the significant benefits gained by being part of FRIC. In particular, they underlined the unique opportunity offered by FRIC to deepen their knowledge and obtain research experience, and the fruitful environment established by close collaborations with partners.

In the last three years, FRIC has attracted many MSc students, producing 11 MSc theses on subjects affiliated with the FRIC research activities and in collaboration with NTNU and RISE FR. The involvement and the research carried out by MSc students bring important benefits by increasing the research output, extending knowledge and research capacities, and training future generations of researchers, scientists, and fire safety engineers. However, FRIC is not always properly acknowledged by MSc students, creating confusion around the involvement and supervision of FRIC in relation to RISE FR, NTNU and/or SINTEF. It is therefore important that, in addition to providing MSc and PhD students with a high quality and dynamic research environment, the FRIC identity is strengthened by involving the students even more in FRIC as a centre.

**Recommendation 9:** To ensure that FRIC continue to attract MSc and PhD students (and funding for their projects) to FRIC, an even clearer process for establishing MSc projects should be established, and ideally this will be done in collaboration with the external partners from industry,



consultancies, and the public sector. Furthermore, it was indicated by external partners that further PhD funding could be obtained if the current scope of FRIC (i.e., beyond the current WPs) was widened. This opportunity, and other similar opportunities, should be considered. Given that the current funding period ends before a new PhD student (with funding from the industry) can complete the studies, such a hire will already extend FRIC beyond 5 years. If external funding is obtained, this would normally result in more FTE for researchers, which can justify widening the research scope in the direction that society and external partners desires, even if outside of the focus areas.

### **Conclusions and final recommendations**

Throughout the evaluation process, and particularly on the evaluation meeting, it was clear that all stakeholders present in the meeting find FRIC to be very valuable. The core institutions (SINTEF, NTNU and RISE FR) were all extremely positive to the collaboration they have through FRIC, and they all expressed that FRIC had provided clear benefits to their organisations. Partners and PhD students also communicated strongly that they had benefitted from the large network that FRIC provides.

Based on the beyond-expectation financial support besides the funding from the Gjensidige Foundation, it is clear that there is a place for a national fire research centre in Norway. The different stakeholders also found that one centre is sufficient, but that requires that the centre indeed acts and operates as a national centre for all of Norway. The first step towards this is to establish a physical place that is the FRIC headquarters, even if this is only a larger office with room for a handful visitors. It is envisioned that a national centre with operational freedom beyond fixed work packages and well-defined expertise and excellences will attract further funding from industry. In fact, one industrial partner expressed that they were ready to provide funding towards a PhD project that was not bound to the current WPs.

The vision and mandate by the Gjensidige Foundation were to establish a centre that can exist beyond the funding period. At the time the evaluation, this was not achieved. However, with careful organizational restructuring, full-time management, and true dedication to increased visibility and identity in the form of a national centre (including a physical home), the evaluation committee believes that FRIC can become a permanent national centre of significant value to the Norwegian society.

The final recommendation of the evaluation committee is that FRIC continues to receive funding for the remainder of the original funding period of 5 years. It is a clear expectation that the other recommendations are considered and that FRIC is indeed a centre with a future at the end of the current funding period. Recommendations for future funding is beyond our mandate, but we want to emphasize that all stakeholders present at the evaluation meeting were adamant that there is a need for a fire research centre in Norway and that they believe FRIC is the right choice for such a centre. This need is in line with what was established in the state-of-the-art review carried out 6 years ago, and FRIC has already closed many of the gaps that were identified, for example through a considerable increase in researchers with a PhD in fire safety.

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