german cooperation
DEUTSCHE ZUSAMMENARBEIT

TVET SKILLS FOR RENEWABLE ENERGY AND GREEN HYDROGEN IN NAMIBIA

Annexure 11: Firefighting

Implemented by

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

IMPRINT

Published by the
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Friedrich-Ebert-Allee 36+40
3113 Bonn, Germany
Phone +49 228 44 60-0
Fax +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
Phone +49 61 96 79-0
Fax +49 61 96 79-17 66

Namibia

Promotion of Technical Vocational Education and Training (ProTVET) Project
10 Rand Street, Khomasdal, Windhoek, Namibia
Phone +264 61 222 447
Email jerry.beukes@giz.de
www.giz.de/en/worldwide/323.html

As at 09/2025

Design
Joyce Kondo
Windhoek, Namibia
joycekondojk.wixsite.com/mysite

Photo credits
Desley Hitiraukunga, ProTVET: Cover, pages 3, 9, 11, 12 and 19
Sam John: pages: 5, 6, 15 and 16,

Responsible
Sybil Ferris (GfA), Emil Spieler and Rodney Seibeb (GIZ ProTVET)

Researcher
Prof Dr Samuel John

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ)

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

GFA CONSULTING GROUP

CONTENTS

ACRONYMS

CoW	City of Windhoek
DFV	Fire Services Association
EDRM	Emergency and Disaster Risk Management
EFAN	European Fire Academy Network
EQF	European Qualifications Framework
FwDV	German Fire Brigade Service Regulation
IFSAC	International Fire Service Accreditation Congress
ISO	International Organisation for Standardisation
LGSETA	Local Government Sector Education Training and Accreditation
NCHE	National Council for Higher Education
NFPA	National Fire Protection Association
NQA	Namibia Qualifications Authority
NQF	National Qualifications Framework
NTA	Namibia Training Authority
PtX	Power-to-X
SABS	South African Bureau of Standards
SADC	Southern African Development Community
SAESI	Southern African Emergency Services Institute

1

ANALYTICAL REPORT

1.1 Status quo: Overview of Existing Firefighters Training Measures and Training Providers

Namibia's landscape for technical and vocational training consists of both public and private institutions. Public vocational training centres focus on providing qualifications specifically developed by the Namibia Training Authority (NTA) and registered on the National Qualifications Framework (NQF). In contrast, some private institutions adopt a more flexible approach, offering a combination of NQF-registered programmes alongside their own uniquely developed courses or franchise programmes from other countries.

Regardless of their status, all vocational training institutions in Namibia fall under the regulatory oversight of the NTA. It is important to note that for vocational programmes at Levels 6 and 7 offered by some private colleges, these qualifications must also receive accreditation from the National Council for Higher Education (NCHE).

This framework illustrates that Namibia has a comprehensive system in place to ensure the delivery of high-quality vocational programmes throughout the country.

However, it is crucial to note that there are currently no national specialised professional certification bodies for many skills essential in the emerging Power-to-X (PtX) fields, such as renewable energy, firefighting, and electrolyser installation.

This gap highlights an area where further development could be beneficial for aligning training with industry needs.

Four firefighting qualifications appear on the NTA list of registered qualifications as follows [1]:

- Q0975-National Vocational Certificate in Firefighting and Rescue Operations Level-1
- Q0976-National Vocational Certificate in Firefighting and Rescue Operations Level-2
- Q0977-National Vocational Certificate in Firefighting and Rescue Operations Level-3
- Q0978-National Vocational Certificate in Firefighting and Rescue Operations Level-4

The four qualifications were registered on the NQF on 28 March 2018 and were due for review in 2023. However, this review has not yet taken place. Since the qualifications were not implemented by the end of their review period, a roll-over was granted. Detailed information about the qualifications can be found on the NTA website (https://unitstandards.nta.com.na/mining-and-quarrying-constructionelectricity-gas-water-supply-and-sanitation/).

Table 1 summarises the comprehensive learning outcomes of all four programmes with their credits and NQF levels.

Table 1: NTA Comprehensive Learning Outcomes of Approved Firefighting and Rescue Qualifications

Qualification No.	Comprehensive Learning Outcome	NQF Credits	NQF Level
Q0975	Holders of this qualification are able to perform administrative tasks, perform station duties, conduct awareness campaigns for fire and emergency services, demonstrate operation of firefighting and rescue tools and equipment, maintain personal protective equipment, maintain fire service and rescue equipment, perform basic fire prevention, adhere to scene safety and command at emergency incident, maintain safe work environment and operational response, demonstrate knowledge of water supply sources, water equipment and accessories.	53	1
Q0976	Holders of this qualification are able to demonstrate basic use of ropes and knots, communicate in emergency service environment, conduct forcible entry, carry out first response at hazardous materials incident, extinguish veld fires, conduct fire prevention on-board ships and vessels, conduct community awareness on firefighting and rescue operations, demonstrate fire service equipment operation, operate fire service ground ladders, perform water loss control operations, perform rescue and extrication operations, apply ventilation techniques and demonstrate knowledge of building construction layout.	84	2
Q0977	Holders of this qualification are able to carry out fire investigations, conduct search and rescue operations, conduct firefighting and rescue operations on job training, manage handling of hazardous substances and materials, drive and operate emergency vehicle, demonstrate knowledge of effects of building collapse, operate fire suppression systems, extinguish aircraft fire, perform	82	3
Q0978	Holders of this qualification are able to establish incident command, conduct firefighting and rescue operations stakeholder consultations, conduct fire risk surveys and safety inspections, manage crew during wildfire suppression, operate specialised aerial hydraulic platform' Provide basic life support, manage crew at incidents involving hazardous materials and supervise fire station duties.	47	4

As shown in Table 1, the NTA-registered programmes highlight several gaps that require attention in the forthcoming revision.

With the renewable energy and green hydrogen being considered as emerging sectors, topics related to hydrogen fires and its derivative chemicals, such as ammonia, which will be essential for the green hydrogen industry in Namibia, are not yet integrated into the qualifications.

These could be incorporated into the basic curriculum or included as short courses to upskill current qualification holders. Section 2 of this report proposes some short courses for this purpose.

1.2 Firefighting Training Providers in Namibia

Currently, three institutions in Namibia offer firefighting training. These are:

- **City of Windhoek's Emergency and Disaster Risk Management Division (EDRM):** Provides accredited firefighting, rescue, and ambulance services courses. This centre is in Windhoek.
- **Nirvana Academy and Investments CC [3]:** Provides various firefighting courses, including Fire Fighting 1 and 2, tailored to different skill levels. This centre is in Walvis Bay.
- **The Knowledge Academy [2]:** Offers comprehensive fire safety training courses in Windhoek, focusing on essential fire prevention, evacuation procedures, and response strategies. This training provider is based in the UK but has a centre in Windhoek. However, every effort to contact the Namibia coordinator of this institute was unsuccessful.

None of the three listed entities have at the time of compiling this report, incorporated hydrogen-related safety training into their training programmes. The programmes offered by each institution and their analysis are shown in the following tables.

City of Windhoek Training Centre

The City of Windhoek: Emergency and Disaster Risk Management (EDRM) Unit is the most comprehensive centre, and it is fully dedicated to firefighters and disaster management training in Namibia. The centre offers a range of fire and rescue courses, as shown in Table 2:

Table 2: CoW Programme Analysis

Programme Title	Codes and Standard Used	International body Recognition	International Certification	NQF-Registered	NTA Registered
Fire Fighter I	NFPA 1001 (National Fire Protection Association, USA)	SAESI; (up to 2009) (Southern African Emergency Services Institute, RSA)		Yes	Yes
Fire Fighter II	NFPA 1001	SAESI (up to 2009)			
Hazmat First Responder-Awareness Level	NFPA 472				
Hazmat First Responder-Operational Leve	NFPA 472				
Fire Fighter Instructor I	NFPA 1041				
Fire Officer I	NFPA 1021				
High Angle Rescue	-				
Self-Contained Breathing Apparatus and Confined Spaces	NFPA1001				
Light Vehicle Rescue and Extrication	NFPA 1001				
Pumping Apparatus Driver and Operator	NFPA 1002				
Portable Fire Extinguishers	SABS: 1475 (South African Bureau of Standards, RSA)				

The City of Windhoek (CoW) initially sought recognition for its training programmes from the South African Emergency Services Institute (SAESI) to gain accreditation from the International Fire Service Accreditation Congress (IFSAC) in the United States.

Since SAESI was already accredited by IFSAC, this partnership aimed to facilitate CoW's credentials. However, the collaboration was halted in 2009 due to financial constraints and other challenges.

Despite limited recognition, CoW remains committed to re-establishing its ties with SAESI and ultimately obtaining IFSAC accreditation.

Detailed discussions regarding the various accreditation bodies are available in Section 1.4.

Currently, CoW's programmes adhere to internationally recognised standards; however, they still lack an official international recognition seal.

Consequently, the NTA serves as Namibia's national certifying body for individuals to become firefighters, underscoring the need for further development of CoW's credentials to compete effectively at an international level.

Regarding trainee intake and training facilities, the standard trainee-to-trainer ratio established by CoW is 15:1. With the current staff capacity, the centre can train a maximum of thirty trainees at any given time; however, it could accommodate more firefighters if staff numbers were to increase.

Figure 1: CoW Firefighters Training Centre, Windhoek

The centre is well equipped with facilities and key equipment for training in basic firefighting and emergency risk and disaster management programmes. It will, however, require additional equipment to incorporate aspects of hydrogen fires and special chemicals. Engagements with CoW training centre officials confirmed that Namibia needs robust international linkages and enhanced inter-regional collaboration.

Currently, the existing cooperation does not function optimally, which hinders collective progress. By fostering these connections, CoW can unlock significant potential for growth and development in Namibia.

Nirvana Academy and Investment

Nirvana Academy and Investment is the second national firefighting training centre, based in Walvis Bay. It is a privately owned institute that offers the NTA's approved National Vocational Certificate programmes, ranging from NQF Level 1 to Level 4.

These programmes are professionally grouped, as shown in Table 3 below.

Table 3: Nirvana Programme Analysis

Programme Title	Codes and Standard	International body Recognition	International Certification	NQF-Registered	NTA Registered
Fire Fighter I and Hazmat Awareness	NFPA 1001		LGSETA	Yes	Yes
Fire Fighter II and Hazmat Operations	NFPA 1001		LGSETA	Yes	Yes

The institution has indicated that it owns sufficient facilities and equipment specifically designed for training at NQF Levels 1 to 4. Furthermore, the instructors employed at Nirvana Academy are all qualified, but limited in number.

The centre manager, together with one instructor, is well trained. It is worth noting that Fire Fighting I, Hazmat Awareness, Fire Fighter II, and Hazmat Operations correspond to NQF Levels 1 to 4.

The qualifications are aligned with internationally recognised best practices in Namibia, demonstrating a commitment to meeting global standards. Furthermore, the qualification at NQF Level 1 adheres to the National Fire Protection Association (NFPA) standards, underscoring the quality of training provided.

Figure 2: Nirvana Training Centre, Walvis Bay

There are notable gaps in training related to hydrogen and ammonia fires. Specifically, the programme currently lacks coverage of hydrogen fire training, which poses a significant concern. With the increasing utilisation of hydrogen as an energy source come unique firefighting challenges that the current qualifications fail to address. The limited knowledge and expertise regarding hydrogen fire characteristics and management techniques highlight this shortfall.

On the downside, Nirvana lacks adequate space and equipment for training. To address this issue, the institution has signed a Memorandum of Understanding (MoU) with the Walvis Bay Fire Brigade to utilise its facilities for practical training. This arrangement is promising and aligns with the NTA's work-integrated learning policy.

The third institution, The Knowledge Academy, merely offers online courses, and all attempts to engage with the institution were fruitless.

1.3 Stakeholder Mapping and Analysis in the RE Hydrogen Sector in Firefighting

Stakeholder Identification

The Namibian firefighting landscape has several stakeholders. Stakeholder mapping categorises them into three groups: Primary Stakeholders, who are directly affected and involved in training; Secondary Stakeholders, who are influential but indirectly affected; and Tertiary Stakeholders, who have limited influence on firefighter training.

Primary Stakeholders (directly affected and involved in training) Firefighters (Permanent, Volunteers, Interns) – Direct beneficiaries of training.

- Firefighters (permanent, volunteers, interns) – direct beneficiaries of training.
- Ministry of Urban and Rural Development (MURD) – oversees training, funding, and deployment.
- Local authorities and municipalities – responsible for employing firefighters and allocating resources.
- Vocational Training Providers (City of Windhoek, Nirvana, and external providers) – deliver firefighter training programmes.
- Accreditation and certification bodies (NTA certifies individuals upon successful completion of training, and the NQA accredits training institutions and programmes).
- Hydrogen industry (production companies, Power-to-X sector) – increasing hydrogen use creates demand for specialised fire training.

Secondary Stakeholders (influential but indirectly affected):

- Namibia Fire Brigade Association (NFBA) – represents firefighter interests and professional standards; currently low-key in operation.
- Ministry of Environment, Forestry and Tourism (MEFT) – concerned with the environmental impacts of fire incidents.
- Namport and airports – concerned with the transportation of PtX products.
- Universities and vocational training providers – potential partners in developing accredited hydrogen fire training.
- Insurance companies – support risk mitigation through trained firefighters.
- Emergency response NGOs (e.g. Red Cross, disaster relief groups) – assist in emergency response and training.
- Private sector (oil and gas, chemical companies, mining industry) – high-risk industries that benefit from trained firefighters.

Tertiary Stakeholders (interest but limited influence):

- General public – indirect beneficiaries of improved fire safety.

- Media and advocacy groups – raise awareness of training needs and gaps.
- Regional and international training partners (e.g. South Africa, Germany) – potential collaborators in firefighter capacity building.

Stakeholder Analysis Using Power-Interest Matrix

Stakeholder	Power (Influence on Training Programmes)	Interest (Concern for Training Development)	Engagement Strategy
MURD	High	High	Close collaboration, policy development, funding support
Firefighters	Low	High	Training participation, feedback integration
Local Authorities	High	High	Resource allocation, programme adoption
Vocational Training Providers (VTPs)	High	High	Curriculum development, training delivery
Hydrogen Industry	High	Medium	Collaboration for specialised training
Namibia Fire Brigade Association	Medium	High	Advocacy for training standards
Universities	Medium	Medium	Research and training development
Insurance Companies	Medium	Medium	Risk mitigation and funding support
Emergency Response Companies	Medium	Medium	Capacity-building collaboration
Private Sector (Mining, Oil and Gas)	High	Low	Industry-specific training partnerships
General Public	Low	High	Awareness and community support
Media and Advocacy Groups	Low	Medium	Awareness campaigns, policy influence
International Training Partners	High	Medium	Capacity-building and exchange programmes

Stakeholder Engagement Plan

High Power, High Interest (Key Players – Close Engagement is Required)

- MURD and Local Authorities: Regular meetings, funding discussions, and collaboration on policies.
- Training Institutions: Joint curriculum development, infrastructure support.
- Hydrogen Industry: Public-private partnerships for funding and specialised training.

High Power, Low Interest (Keep Satisfied)

- Ministry of Higher Education: Involvement in accreditation but not day-to-day training operations.
- Private Sector (Mining, Oil and Gas): Inform on training relevance and encourage sponsorships.

Low Power, High Interest (Keep Informed and Engaged)

- Firefighters: Provide training updates and involve in curriculum feedback.

- General Public and Media: Awareness campaigns on hydrogen fire risks and preparedness.
- Universities and VTPs: Encourage research partnerships in f irefighter training innovation.

Low Power, Low Interest (Monitor Periodically)

- Regional and International Training Partners: Seek support when necessary.
- Advocacy Groups and NGOs: Involve in awareness initiatives as needed.

Conclusion

Namibia's firefighter training landscape requires strategic collaboration among various stakeholders. Given the rising use of hydrogen and the current shortage of trained firefighters, stakeholder engagement must focus on funding, capacity building, policy development, and specialised training programmes.

Establishing a strong network between government, industry, and training institutions will be crucial for equipping firefighters to manage emerging fire risks effectively.

1.4 International Benchmarking Firefighters Training and Certifications

Firefighting Training: Global Standards and Certifications

Firefighting training is based on internationally recognised standards, yet each country provides specific regulations. Consequently, the sector is shaped by both international standards and unique national requirements. Each country has its own framework, leading to significant variations in training protocols worldwide.

Despite these discrepancies, some international standards are widely accepted and utilised in the firefighting sector. Identifying these common standards is crucial for establishing a consistent training framework across borders, which can enhance firefighting efficiency and safety on a global scale.

One of the most prominent and widely recognised international standards in the firefighting sector is the National Fire Protection Association (NFPA) standards from the USA. These standards are extensively referenced and adopted in numerous countries around the world.

The NFPA covers a broad range of areas, including firefighter safety, equipment maintenance, operational procedures, and fire prevention. While the NFPA provides standards rather than certifications, its guidelines—such as NFPA 1001 (Standard for Fire Fighter Professional Qualifications) and NFPA 2 (Hydrogen Technologies Codes)—are the most widely used benchmarks for firefighter training and hydrogen technologies globally.

The International Fire Service Accreditation Congress (IFSAC), based in the USA, is one of the most recognised and respected firefighting certification bodies worldwide.

IFSAC provides accreditation for fire service-related degree programmes, certification, and training programmes, ensuring they meet rigorous international standards. Its accreditation is widely recognised, particularly in North America, and is often seen as a mark of quality and adherence to best practices. For Namibia, adopting IFSAC accreditation could be a strong option to ensure international recognition and alignment of its firefighting training programmes with global standards.

Another key example is the International Organisation for Standardisation (ISO), a globally recognised body that develops international standards for a wide range of industries, including firefighting. ISO provides guidelines and standards for firefighting equipment, operational practices, and safety management systems.

For instance, ISO 45001 focuses on occupational health and safety, which can complement firefighting training programmes by ensuring alignment with global safety protocols. While ISO does not directly certify firefighting programmes, its standards are widely adopted and serve as a benchmark for best practices in fire safety and emergency response worldwide.

However, the adoption and implementation of these standards vary greatly, influenced by factors such as economic capacity, local fire risks, and resource availability. For instance, Namibia faces significant financial challenges in fully aligning with these standards due to limited funding and infrastructural constraints, leading to gaps in training quality and preparedness, as shown in Section 1.2.

Firefighter Training and Certification In Europe and South Africa

In Europe, firefighter training and certification programmes are developed and regulated at the national level by each EU member state.

These programmes are typically overseen by national fire services, government ministries, or professional bodies, depending on the country. For example:

- In Germany, certification follows the German Fire Brigade Service Regulation (FwDV) and is delivered through state-operated academies.
- In France, firefighters are certified by the National Firefighters' School (ENSOSP), which operates under the Ministry of the Interior.
- In Italy, the National Fire Brigade (Vigili del Fuoco) is responsible for certification and training.

While certification processes vary, most European countries adopt modular training systems that include basic, advanced, and specialised levels, with formal examinations at each stage.

To promote consistency across Europe, the European Fire Academy Network (EFAN) works to harmonise firefighting training standards and ensure programmes meet EU-wide benchmarks. EFAN's focus on high-quality training and alignment with EU standards makes it a relevant option for Namibia, especially given the Namibian hydrogen industry's growing collaboration with EU companies.

Although certification remains national, European frameworks help align qualifications and ensure interoperability:

- **European Qualifications Framework (EQF):** The EQF standardises qualifications across the EU by assigning levels (1 to 8) based on skills, knowledge, and competencies. Member states can map their firefighter certifications to EQF levels, facilitating cross-border recognition of qualifications.

- **EN and ISO Standards:** European (EN) and international (ISO) standards for equipment, safety procedures, and operational protocols are widely adopted and indirectly shape training and certification requirements.

In summary, while there is no single EU-wide certifying body for firefighting, several organisations play key roles in promoting consistency and recognition of qualifications:

- **National Fire Services or Training Academies:** These are the primary certifying bodies in each country.
- **European Fire Academy Network (EFAN):** This network works to harmonise training standards across Europe.
- **International Fire Service Accreditation Congress (IFSAC) and Pro Board:** Although these are global organisations, their certifications (e.g., NFPA standards) are recognised in some EU countries, particularly for specialised training.

In South Africa, the Southern African Emergency Services Institute (SAESI) primarily oversees firefighter certification. SAESI offers accredited training programmes aligned with international standards, such as those from the National Fire Protection Association (NFPA) and the International Fire Service Training Association (IFSTA).

The International Fire Service Accreditation Congress (IFSAC) accredits these programmes, ensuring that the training meets globally recognised benchmarks [4].

Additionally, the Local Government Sector Education and Training Authority (LGSETA) accredits certain firefighting courses provided by various fire colleges across the country. These courses are designed to meet the specific needs of local municipalities and are aligned with the South African Qualifications Authority (SAQA) standards.

It is important to note that, at the time of compiling this report, while SAESI's courses are internationally recognised, they are not yet aligned with the National Qualifications Framework (NQF) in South Africa, although efforts are underway to achieve this alignment [5].

Aspiring firefighters typically undergo training at accredited institutions, which may include municipal fire academies or private training centres. Upon successful completion of the required training and assessments, individuals receive certification from the accrediting body, validating their qualifications to serve as professional firefighters in South Africa.

Firefighters Training and Certification in Namibia

In Namibia, firefighter training at NQF Levels 1 to 6 is primarily overseen by the Namibia Training Authority (NTA), which registers training programmes and institutions in the field of firefighting and rescue operations. The NTA ensures that these programmes meet the national standards set by the Namibia Qualifications Authority (NQA) [6].

Training institutions such as the Emergency Management Training Centre (operated by the City of Windhoek's Emergency and Disaster Risk Management Division) and Nirvana Academy offer courses accredited by the NTA and other international bodies, as previously explained. These courses encompass various aspects of firefighting, rescue, and emergency medical services.

Upon successful completion of the accredited training programmes, individuals are awarded certifications that validate their firefighting and rescue operations competencies and ensure alignment with national standards.

The CoW training programmes were also developed with the support of, and in alignment with, the International Fire Service Accreditation Congress (IFSAC) standards and were approved by the Southern African Emergency Services Institute (SAESI).

However, due to the requirement for a national certification body, the CoW Emergency and Disaster Risk Management (ERDM) centre lost its IFSAC accreditation. SAESI, however, continues to recognise their training.

1.5 Needs and Gap Analysis in Hydrogen Fire Firefighting Training in Namibia

An online survey was adopted to reach a broad base of stakeholders, located mostly within various regions of the country. The survey aimed to identify the skills needed by firefighters, with an emphasis on hydrogen fires, and to gauge the availability of programmes specifically for firefighters in Namibia. A summary of the survey results is provided below.

The data collected through the questionnaire revealed valuable insights into the firefighting experience of the respondents. Of the respondents, 27% were female and 73% male, indicating that the firefighting landscape in Namibia is male-dominated. Most have experience with various types of fires, with residential fires being the most common (69.6%). This indicates that many firefighters are well prepared to handle everyday situations that occur in residential settings, highlighting a familiarity with the challenges and protocols associated with these incidents. Experience with commercial building fires is also notable, with 60.9% of respondents reporting such exposure.

This suggests a significant level of preparedness for emergencies in environments that may involve a variety of hazards and structural complexities. Similarly, 52.2% of respondents have dealt with industrial fires, which can be more complex due to the presence of flammable materials and potentially hazardous conditions.

However, a critical gap is evident, as no respondents reported experience with hydrogen fires (0%). This lack of expertise indicates a significant vulnerability in firefighting capabilities, especially considering the increasing use of hydrogen in various industrial sectors and the potential risks associated with hydrogen-related incidents. Overall, while the results reflect a solid foundation of experience in traditional fire scenarios, they also underscore the need for ongoing education and training in specific high-risk areas such as hydrogen fires. When participants in the survey were asked if they would support the introduction of a course on hydrogen fires for firefighters, an overwhelming 96.2% supported the introduction of hydrogen firefighter training in Namibia, highlighting industry-wide recognition of the need for specialised skills in this emerging sector.

In addition, when asked if their organisations would enrol in such a course, 88.5% responded positively, while only 11.4% were unsure. This indicates significant interest in training locally qualified firefighters. The overwhelming support of 96.2% suggests that there is widespread acknowledgement within the industry of the unique challenges and risks associated with hydrogen as it becomes more prevalent in various applications and as more hydrogen production companies establish themselves in Namibia. Moreover, the high percentage (88.5%) of participants expressing willingness to enrol their organisations in such training highlights a proactive approach to safety and preparedness within the sector.

This interest reflects a recognition of the potential hazards associated with hydrogen handling and the importance of equipping firefighters with specialised knowledge and skills to address these challenges effectively. Overall, the data reflects a robust demand for specialised training in hydrogen firefighting.

Such training could be pivotal in enhancing safety protocols and ensuring that firefighting personnel are adequately prepared to respond to hydrogen-related incidents. Establishing training programmes in this area would not only meet industry needs but also contribute to a safer operational environment as the use of hydrogen technology continues to expand. In addition, this could create opportunities for local training initiatives, benefiting the firefighting community and enhancing overall public safety in Namibia.

Interview with the Ministry of Urban and Rural Development (MURD)

The Directorate of Risk and Disaster Management, operating under the Ministry of Urban and Rural Development (MURD), is tasked not only with financing and equipping local authorities in Namibia with firefighting and emergency response equipment but also with overseeing the training and deployment of firefighters.

This ministry is responsible for maintaining comprehensive statistics on the availability of trained firefighters and identifying any gaps in personnel or resources to ensure effective emergency response across the country.

The following key information could be derived from the interview:

Current Status of Firefighters in Government Duty in the Country

- **Total Permanent Firefighters (FF):** 221
- **Trained Firefighters at Level 1 & 2 certification:** 176
- **Volunteers and Interns:** 226

Required vs. Current Numbers

- **Minimum Requirement:** 6 trained firefighters per local authority (56 total authorities). Total Needed: 56 × 6 = 336 trained firefighters.
- **Current Trained FF:** 176 (only 52% of the required minimum).
- **Annual Training Target:** 350 firefighters (to address gaps and turnover).

Key Shortfalls

- **Deficit of Trained FF:** 160 (336 required – 176 available).
- **Uneven Distribution:** Windhoek has 120 trained FF (exceeds requirement),(exceeds requirement), while 20 authorities have 0 trained FF (e.g., Outjo, Grootfontein, Opuwo). Volunteers fill gaps but lack certification (e.g., Omaruru, Katima Mulilo).

Training Infrastructure

- **Insufficient Centres:** CoW (City of Windhoek), SA (South Africa), Nirvana, Swakopmund Municipality are primary trainers, indicating limited local capacity.

Collaboration with NTA

- MURD has also reached out to NTA to collaborate by providing firefighting training in conjunction with some of the municipalities that already possess equipment and facilities for the training. NTA also informed MURD that they are considering offering firefighting programmes at certain VTPs throughout the country, and the new VTC in Keetmanshoop was mentioned as a potential location.

  In conclusion, Namibia faces a significant shortage of trained firefighters, with only 52% of the minimum required personnel. Geographic disparities and the lack of training infrastructure exacerbate the issue. Immediate action to scale training programmes and certify volunteers is critical to achieving sufficiency.

2

RECOMMENDATIONS FOR NECESSARY SHORT COURSE AND TRAINING MEASURES IN HYDROGEN FIREFIGHTING

2.1 Brief Outline and Description of Recommended Short Courses in Hydrogen Firefighting Training

The study indicates that at least two institutions possess the necessary facilities and capacity to provide foundational firefighting training. Although this is inadequate to meet Namibia's needs, it serves as a solid starting point. Nevertheless, there is a significant lack of experience in managing hydrogen fires and their derivatives, such as ammonia, methanol, and synthetic fuel.

To prepare Namibia for the emerging renewable Power-to-X (PtX) industry, the development of short courses as micro-credentials or stand-alone unit standards at NQF Levels 4 to 6 is proposed to address these critical gaps. Accordingly, the following short courses are recommended and prioritised in the table below, each with a brief description of its aim:

No.	Title of Training	Aim of training	NQF Level
1	First Responder Training for Hydrogen and Chemical Fires	Train emergency responders to safely assess, contain, and mitigate hazards during hydrogen and chemical fire incidents while ensuring public and firefighter safety.	4
2	Hydrogen Firefighting and Explosion Management	Provide firefighters with technical and practical expertise in managing hydrogen fires, mitigating explosion risks, and applying effective suppression techniques.	5
3	Fire Risk Assessment and Prevention for Hydrogen Facilities	Develop firefighters' ability to assess risks, implement fire prevention strategies, and ensure compliance with fire safety standards at hydrogen production, storage, and transportation sites.	6
4	Train-the-Trainer: Hydrogen Fire Safety Instructors Course	Equip instructors with specialised knowledge and teaching methodologies to train firefighters in hydrogen fire safety, explosion prevention, and emergency response.	6

It is strongly recommended to prioritise the first three short courses to become the critical components in training Namibia's firefighters in hydrogen and PtX firefighting techniques. The initial short course should be launched in collaboration with the HyResponder Project [7], a European initiative dedicated to enhancing hydrogen safety training for first responders.

This partnership would provide invaluable training materials and hands-on training, ensuring that our firefighters are well-equipped to effectively handle these emerging challenges.

2.2 Recommendation for Upskilling Training Measures Related to the Short Courses

A critical analysis of the approved National Vocational Certificate in Firefighting and Rescue Operations (NQF Levels 1–4) reveals that current training programmes for firefighters effectively cover foundational fire risk areas, preparing them to tackle residential, commercial building, and wildfires.

However, significant gaps remain in addressing the challenges posed by hydrogen fires and their derivatives, such as ammonia.

Certified holders of Firefighter I and II qualifications are potential candidates for upskilling to handle these specific hazards. Therefore, it is essential for these professionals to undergo short courses, workshops, and on-the-job training programmes focused on hydrogen firefighting techniques.

Moreover, enhancing the current NTA programmes to incorporate advanced training for hydrogen firefighting during their revision is crucial. This enhancement is not merely a suggestion; it is a vital step toward improving vocational education in Namibia and ensuring that firefighters are equipped with the latest strategies for effective response.

To address these training gaps, the development of several targeted short courses, specifically designed to equip professionals with the necessary skills to manage incidents related to hydrogen, is recommended.

The proposed short courses will be offered by selected centres identified by the NTA. At the time of writing, the only centre with adequate facilities to offer these courses is the CoW training centre in Windhoek. Nirvana's facilities and equipment are currently insufficient for delivering specialised programmes.

2.3 Short Courses: Brief Outline of Skills and Competencies Required

Title of Short-Course 1:	**First Responder Training for Hydrogen and Chemical Fires**		
Description:	This course provides a foundational understanding of hydrogen and chemical fire hazards, focusing on safe assessment, containment, and mitigation. It is designed for emergency responders with no prior knowledge, making it the ideal starting point	NQF Level 4	
Target Group	Firefighters, Emergency Medical Teams, Industrial Safety Personnel	Duration	2 days
Comprehensive outcome	Firefighters will gain basic skills to safely respond to hydrogen-related incidents		
Learning outcomes	• Respond safely to hydrogen and hazardous material incidents • Apply first aid and decontamination procedures • Coordinate emergency response efforts		
Topics	1. Hazardous material classification and identification 2. Scene control and containment strategies 3. Personal protective equipment (PPE) for hydrogen fires		
Practical Sessions	• Simulation of a hazardous materials (HAZMAT) incident response. • Fire suppression drill using different extinguishing agents. • Evacuation and casualty handling practice		
Competencies Gained	• Ability to assess and respond to hydrogen and chemical fire incidents. • Competency in first aid and decontamination protocols. • Proficiency in inter-agency coordination during hazardous incidents		
Title of Short-Course 2:	**Hydrogen Firefighting and Explosion Management**		
Description:	This course builds on the first responders training for hydrogen and chemical fires by providing technical and practical expertise in managing hydrogen fires and mitigating explosion risks.	NQF Level 5	
Target Group	Firefighters, Emergency Medical Teams, Industrial Safety Personnel	Duration	2 days
Comprehensive outcome	Firefighters will learn effective suppression techniques and explosion management strategies.		
Learning outcomes	• Recognise hydrogen fire risks and explosion hazards. • Apply effective suppression techniques. • Safely manage fire incidents involving hydrogen		
Topics	• Hydrogen properties and fire behaviour. • Fire suppression techniques and response strategies. • Hydrogen storage, transportation, and risk assessment.		
Practical Sessions	• Hands-on training with hydrogen flame detection tools. • Suppression of controlled hydrogen gas leaks. • Conducting an emergency response drill for a hydrogen explosion scenario.		
Competencies Gained	• Ability to identify and mitigate hydrogen fire risks. • Proficiency in using appropriate suppression techniques. • Competency in emergency response planning for hydrogen facilities.		

Title of Short-Course 3:	**Fire Risk Assessment and Prevention for Hydrogen Facilities**		
Description:	After gaining practical firefighting skills, this course will help firefighters understand how to assess risks and implement prevention strategies at hydrogen facilities. This is critical for long-term safety and compliance.	NQF Level 6	
Target Group	Safety Managers, Emergency Planning Personnel, Industrial Safety Personnel	Duration 2 days	
Comprehensive outcome	Trainees will be able to identify risks and develop fire prevention plans for hydrogen production, storage, and transportation sites.		
Learning outcomes	• Conduct risk assessments for hydrogen production and storage facilities. • Develop fire prevention and mitigation strategies. • Ensure regulatory compliance with safety standards.		
Topics	• Hydrogen hazard identification and risk control. • Pre-incident planning for industrial hydrogen facilities. • Safety audits and regulatory frameworks.		
Practical Sessions	• Conducting a site-specific hydrogen fire risk assessment. • Developing an emergency response plan for a hydrogen production plant. • Tabletop simulation of a large-scale hydrogen-related fire incident.		
Competencies Gained	• Ability to conduct fire risk assessments for hydrogen operations. • Proficiency in developing and implementing fire prevention strategies. • Competency in ensuring regulatory compliance and safety auditing.		
Title of Short-Course 4:	**Train-the-Trainer: Hydrogen Fire Safety**		
Description:	This is the most advanced course and is designed for instructors who will train other firefighters. It should only be taken after completing the other courses and gaining sufficient field experience.	NQF Level 6	
Target Group	Fire Instructors, Safety Managers, Emergency Response Trainers.	Duration	3 days
Comprehensive outcome	Trainees will become certified trainers, capable of teaching hydrogen fire safety to others.		
Learning outcomes	• Develop instructional skills to train personnel in hydrogen fire safety. • Understand hydrogen-specific fire risks and suppression techniques. • Conduct practical training sessions with real-world case studies		
Topics	• Fundamentals of hydrogen combustion. • Teaching methodologies for fire safety training. • NFPA, ISO, and EU standards for hydrogen fire safety. • Conducting live fire drills and simulations.		
Practical Sessions	• Designing and delivering a mini training session. • Conducting a hydrogen fire suppression drill. • Evaluating fire safety compliance in a mock facility. • Ability to design and deliver hydrogen fire safety training programmes. • Competency in conducting live fire demonstrations. • Proficiency in interpreting and applying fire safety regulations.		
Competencies Gained	• Ability to design and deliver hydrogen fire safety training programmes. • Competency in conducting live fire demonstrations. • Proficiency in interpreting and applying fire safety regulations.		

Admission criteria

For all the proposed short courses, the admission criteria will be decided during the full development of the short courses.

2.4 Needs Related to the Short Courses

The survey reveals that there is little expertise in firefighting competencies related to hydrogen fires and their derivatives. Although some staff at the CoW training centre have participated in masterclasses on hydrogen fires, they are not experts in this field. As a result, trainers and senior firefighters nationwide should be targeted for capacity building to enable them to deliver appropriate training in this category.

To initiate this process, a proposed Train-the-Trainer programme on Hydrogen Fire Safety could be developed, led by specialised trainers from Europe. Potential partners for this initiative are listed in the next section. To effectively equip instructors and firefighters for this specialised training, it is crucial to consider the facilities and equipment required for handling hydrogen-related incidents.
Training firefighters in hydrogen fire safety requires specialised equipment and facilities to ensure they are well prepared to handle hydrogen-related incidents. Hydrogen poses unique risks due to its high flammability, low ignition energy, and invisible flame, so training must be tailored to address these challenges.

The following is a list of essential facilities and equipment required for this training:

Training Facilities

Hydrogen Fire Simulators:

- Controlled environments where hydrogen fires can be safely simulated, allowing firefighters to practice extinguishing techniques.
- These simulators should replicate real-world scenarios, such as hydrogen leaks, vehicle fires, or storage tank incidents.

Outdoor Training Grounds:

- Open spaces designed for large-scale hydrogen fire simulations, including pipeline leaks, vehicle fires, or industrial accidents.
- These areas should have proper safety measures, such as fire suppression systems and emergency shut-off valves.

Indoor Training Facilities:

- Enclosed spaces for training on hydrogen leaks in confined areas, such as garages, warehouses, or hydrogen refuelling stations.
- These facilities should be equipped with ventilation systems to safely disperse hydrogen gas.

Virtual Reality (VR) Simulators:

- VR systems can provide immersive training for hydrogen-related emergencies without the risks associated with live fire training.
- These simulators can replicate complex scenarios, such as hydrogen leaks in urban environments or industrial settings.

Safety Equipment

Hydrogen Detectors and Sensors:

- Portable and fixed hydrogen gas detectors to train firefighters in identifying and monitoring hydrogen leaks.
- These devices should be capable of detecting hydrogen at low concentrations (e.g., 1-4% by volume, which is within the flammable range).

Thermal Imaging Cameras:

- Hydrogen flames are often invisible to the naked eye, so thermal imaging cameras are essential for locating and assessing hydrogen fires.

Personal Protective Equipment (PPE):

- Fire-resistant suits, gloves, and helmets designed for high-temperature environments.
- Hydrogen-specific PPE, such as face shields and respiratory protection, to guard against burns and inhalation risks.

Explosion-Proof Equipment:

- Tools and lighting designed for use in explosive atmospheres, as hydrogen is highly flammable and can ignite easily.

The CoW training centre offers notable training facilities, specifically identified as levels 1 to 3; however, it lacks modern virtual-reality simulators that would enhance the training experience. Regarding safety equipment, the centre appears to have items from lists 3 and 4, but supplementary equipment is likely required to ensure that comprehensive safety protocols are met.

This analysis highlights the strengths and limitations of the training centre's current resources, pointing to areas for potential improvement and investment in technology and safety gear.

Figure 3: CoW Training Centre Fire Trucks

The City of Mariental Municipality has proposed establishing a Technical and Vocational Education and Training (TVET) programme for Namibian firefighters. It is envisaged that the programme will be located at the newly refurbished Kai and Ganaxab Youth Training Centre.

The proposal outlines the necessary equipment for the school's operation and incorporates the National Vocational Certificates in Fire and Rescue Operations at Levels 1 and 2. After visiting and inspecting the site, it was confirmed to be spacious and with the potential to become a centre of excellence for specialised training, including courses on hydrogen firefighting.

2.5 Recommendations for Potential Partnerships for Development and Collaboration to Support Skills Development Efforts

Proposed National Partnerships

One observation made during the current study is that there are inadequate firefighting training centres nationwide. One reason is the cost of the required facilities and equipment for effective firefighting training. Therefore, one of the first national partnerships, considered critical, is the partnership between certain municipalities with well-equipped fire departments and vocational centres in the region.

This is in line with a request from the Mariental Municipality, as mentioned earlier.

Moreover, since municipalities are not typically known for operating vocational training institutions, it becomes challenging for many to run accredited technical vocational institutes effectively. In light of this, the development of a dual vocational training college model, as depicted in Figure 5, is proposed.

This initiative would improve collaboration between vocational training institutes and municipalities. It also addresses the specialised training needs for hydrogen fires and their derivatives, while significantly reducing the critical gaps in firefighter training across the nation. By replicating this model in strategic locations nationwide, training gaps identified in this study can be effectively closed.

The proposed model is based on the German Dual Education System, a unique and highly effective approach that combines practical on-the-job training at a company with theoretical education at a vocational school. It is a cornerstone of Germany's education and workforce development system, designed to prepare students for skilled professions in various industries.

In the proposed model, students will split their time between working at a municipal fire brigade department and attending a vocational school. At the city fire brigade, they gain hands-on experience under the guidance of experienced firefighters, while at school, they learn the theoretical foundations of fire science and specialised topics. This dual approach will ensure that students understand the "why" behind their work and master the "how".

The system can be structured to fit the Namibian context. Upon completion, trainees will take exams based on the theoretical and practical components, which will be approved by NTA and NQA, and receive nationally recognised qualifications.

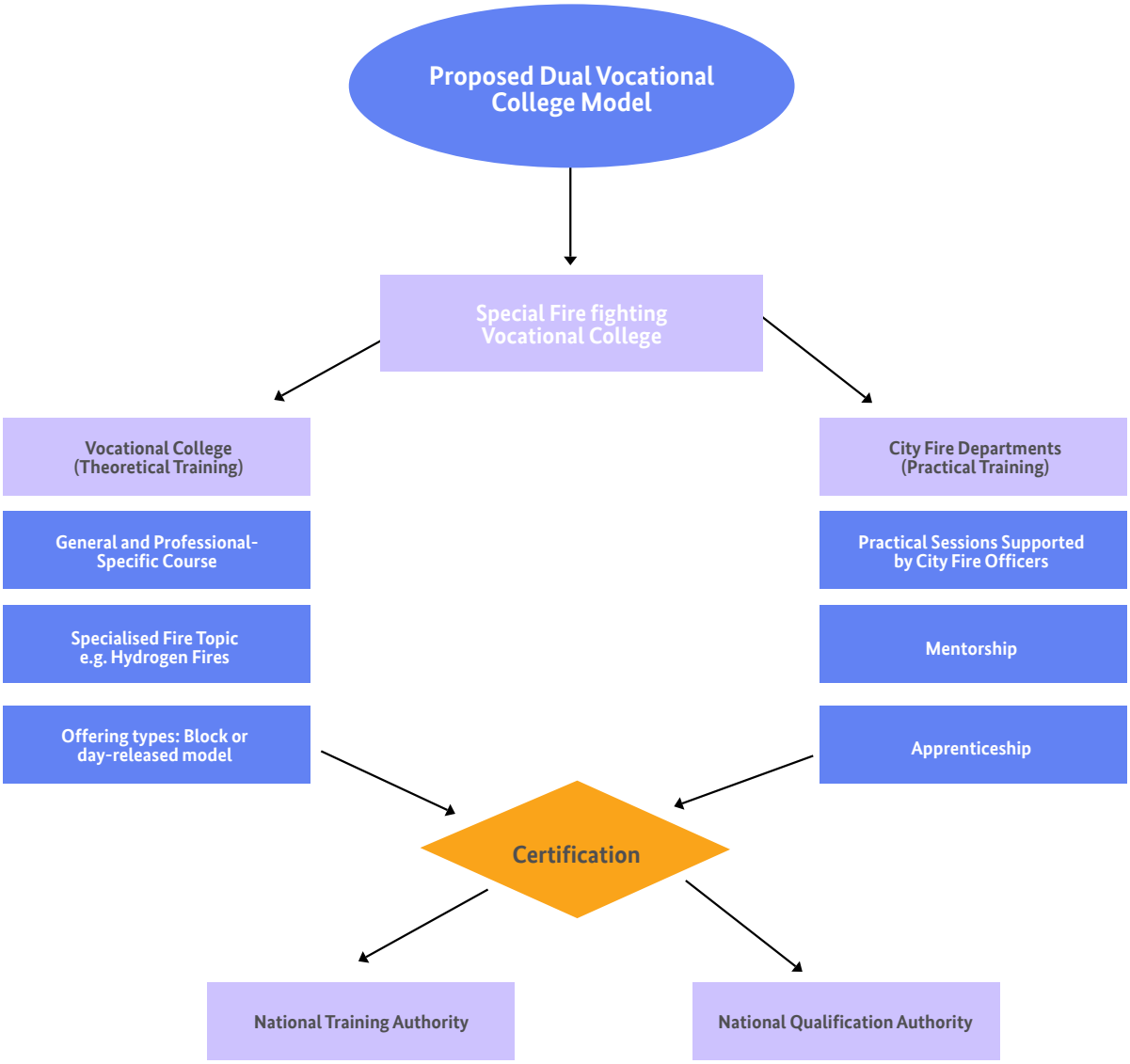

Figure 5: Proposed Dual-Education Model

Proposed International Partnershipsand Accreditation

To gain international recognition for Namibian firefighters, there is a need for international accreditation and partnerships.

International Accreditation

The International Fire Service Accreditation Congress (IFSAC) is the most prominent international firefighting accrediting body, based in the USA. International accreditation is crucial for Namibian firefighters, as it ensures their skills and qualifications are recognised not only locally but also across borders. During consultations with the City of Windhoek (CoW) firefighting training centre, officials expressed a strong desire to obtain accreditation from IFSAC.

Achieving this accreditation would significantly enhance the training programme's credibility, allowing firefighters to compete more effectively in the global job market. It would also open opportunities for collaborative training exercises, knowledge sharing, and best practices with international firefighting organisations. Furthermore, accreditation could lead to improved safety standards and operational effectiveness within Namibia, ultimately benefiting the communities served.

By aligning with internationally recognised standards, Namibian firefighters would not only elevate their professional status but also bolster public trust in their capabilities.

EU Partnerships

To establish a robust hydrogen fire safety training programme in Namibia, collaborating with experienced European organisations can provide valuable insights and resources. One key proposal is a partnership with the HyResponder project, a pan-European initiative focused on developing a network of responder trainers specialising in hydrogen safety. The programme offers comprehensive training materials and conducts courses across various European countries, emphasising the importance of standardised hydrogen safety protocols.

HyResponder's expertise in hydrogen firefighting is particularly relevant, having successfully trained emergency responders in countries where hydrogen technologies are integrated into energy and transportation sectors. Its collaborative approach fosters knowledge sharing among EU member states actively investing in hydrogen production and infrastructure.

Considering that several EU countries are investing in a green hydrogen industry in Namibia, forming a partnership with HyResponder could be instrumental. It provides tailored training resources and has hands-on experience in creating competency frameworks for first responders, ensuring safety standards are met as hydrogen systems are implemented.

Moreover, establishing a partnership with HyResponder could facilitate knowledge transfer and capacity building, helping Namibia not only enhance its emergency response capabilities but also align with international safety standards. This alignment will be crucial as Namibia seeks to attract investment in the growing hydrogen sector, ensuring that both local and foreign stakeholders are confident in the safety measures surrounding hydrogen technologies.

Overall, working with HyResponder could position Namibia as a leader in hydrogen safety training in the region, fostering a culture of safety and preparedness as the country advances its green hydrogen initiatives.

Germany Partnerships

In Germany, fire training is highly organised and structured, typically managed by regional fire departments, specialised fire academies, and professional training institutions. Training programmes are designed to meet national standards and cover a wide range of topics, including fire prevention, firefighting techniques, rescue operations, hazardous materials handling, and disaster response.

The German Fire Protection Association (vfdb) and the German Fire Services Association (DFV) play key roles in setting standards and promoting best practices.

Each German state (Bundesland) has its own fire academy responsible for training firefighters and emergency personnel. These academies offer both basic and advanced training programmes. Notable examples include the State Fire Academy Baden-Württemberg and the Hessian State Fire Brigade School, both of which could be strategic partners for Namibia.

In addition, the German Fire Academy (DFA – Deutsche Feuerwehr-Akademie) is a leading institution for fire service training and education, offering specialised courses and certifications, and could therefore be another key partner.

South Africa Partnerships

It is also critical to establish alliances within the Southern African Development Community (SADC) region to facilitate regional articulation.

The South African Emergency Services Institute (SAESI) is a leading organisation providing training, certification, and professional development for emergency services personnel, including firefighters. SAESI offers internationally recognised courses in areas such as firefighting, rescue operations, and hazardous materials handling. It also provides train-the-trainer programmes, which could help Namibia build its own training capacity.

Strengthening alliances within SADC is pivotal not only for regional cooperation but also for advancing the standards and effectiveness of emergency services across member states.

By leveraging SAESI's expertise, Namibia could significantly elevate the skills and knowledge of its firefighters and emergency responders. SAESI's internationally recognised courses promise to equip Namibian personnel with critical competencies to tackle a variety of emergencies.

Moreover, SAESI's train-the-trainer programmes are particularly beneficial. By developing local trainers, Namibia can create a sustainable system of knowledge transfer, ensuring that skills and best practices are maintained within the country in the long term. This not only builds local capacity but also fosters a sense of ownership and empowerment within the emergency services community.

Conclusion

Achieving international recognition for Namibian firefighters through accreditation and strategic partnerships is essential for enhancing training, operational effectiveness, and public trust.

Collaborating with organisations such as IFSAC and HyResponder would elevate the skills and competencies of local firefighters while aligning Namibia with global safety standards. Partnerships with German fire training institutions and regional alliances, such as with SAESI, will further foster knowledge transfer and capacity building.

Collectively, these efforts will position Namibia as a leader in fire safety training and support the safe integration of emerging technologies, particularly in the hydrogen sector.

3

LITERATURE AND DOCUMENTS USED

1. Namibia Training Authority, "Qualifications and Unit Standards Portal," [Online]. Available: https://unitstandards.nta.com.na. [Accessed January 2025].

2. Nirvana Academy and Investment CC, "Nirvana Academy and Investment CC," [Online]. Available: https://nirvana.co.na/training-courses/?utm_source=chatgpt.com. [Accessed 30 January 2025].

3. The Knowledge Academy Ltd, "The knowledge academy," 2025. [Online]. Available: https://www.theknowledgeacademy.com/na/courses/fire-safety-training/fire-safety-training/windhoek/?utm_source=chatgpt.com. [Accessed 30 January 2025].

4. South African Emergency Services Institute , 2025. [Online]. Available: https://www.saesi.com. [Accessed 4 February 2025].

5. South African Cooperative Governance , "Directorate: Fire Services," 2018. [Online]. Available: http://www.fireservices.gov.za. [Accessed 4 February 2025].

6. City of Windhoek CC, "Training: Emergency and Disaster Risk Management," 2024. [Online]. Available: https://www.windhoekcc.org.na. [Accessed 4 February 2025].

7. Hy Responder, "European Hydrogen Train the Trainer Programme for Responders," Clean Hydrogen Partnership, [Online]. Available: https://hyresponder.eu. [Accessed 6 February 2025].