

Summary

The research project within the frame of the BMBF's "Sustainable Development of Urban Regions (NUR)" programme aims at contributing to a deeper understanding of risk-related urban sustainability. The overarching project goal is to establish a holistic, comprehensive and integrative multiple risks management of extreme events in fast growing (mega)cities in Myanmar – with Yangon as case study and transferability to four further large cities in Myanmar (and potentially for Southeast Asia).

During the preliminary and definition phases, a transdisciplinary project consortium was established with partners from research, government, administration, the private sector, public institutions and the civil society, namely the University of Cologne, the Fire Department of the City of Cologne, the Flood Protection Centre of the Municipal Drainage Operation Cologne and the Yangon City Development Committee as core partners; further collaboration and observation partners from Germany and Myanmar are contributing. Major aims of the research and development (R&D) phase of the project are: (1) establishment of a metadata inventory on existing databases for a holistic disaster risk management; (2) contribution to an effective institutional disaster risk reduction by strengthening institutional preparedness and exchange; (3) conceptualisation and evaluation of an effective, inclusive, culturally adapted prevention programme for the civil society, in raising awareness on natural disasters and personal preparedness, incl. against the loss of personal documents; (4) conceptualization of a prevention programme for the loss of the economic basis with a focus on system relevant services, such as private clinics, food and water providers; and (5) conceptualisation of a dialogue platform for innovative ideas for build back better strategies in the Covid-19 pandemic.

The development of locally adapted multiple risk management concepts to increase the resilience of the local stakeholders are at the core of the project. The transdisciplinary project will conduct disaster risk reduction measurements with scientific monitoring and evaluation. With a mixed-methods approach, data surveys will be conducted to conceptualise, adapt and evaluate appropriate awareness raising measurements. Workshops and conferences will serve as basis for strengthening the intra- and international institutional exchange on the project's results. Yangon and Cologne (and during the implementation phase also the other large cities of Myanmar) are expected to mutually benefit from the international exchange, the joint conceptualization and implementation of the concepts.

1 Multiple risks management in (mega)urban regions

1.1 Multiple risks – challenges for the sustainability of fast growing (mega)cities

In the current "urban millennium", improved sustainability of (mega)cities is a global imperative. If cities cannot be made sustainable, global sustainability will not succeed (WBGU 2016). (Mega)cities can be conceptualised as complex adaptive systems in nodal position of global urban networks (Butsch et al. 2016, Kraas et al. 2019). Due to the large concentration of population, infrastructure, political and socio-economic primacy, combined with high urban transformation dynamics, (mega)cities are strongly at risk by multiple natural and human-made disasters (Kraas 2008, Nicholls et al. 2008). Strengthening the transformative power of (mega)cities by integrative, holistic approaches of modern risk research thus contributes to more resilient societies and livelihoods (Garschagen et al. 2014, Solecki/Pelling/Garschagen 2017). Securing critical infrastructure (e.g. water, food and medical supply, transportation and electricity) are even in "normal" times difficult to manage, particularly in (mega)cities of the Global South, let alone in situations of disaster. Socio-economic deficits (e.g. social fragmentation and poverty) and unregulated, informal processes reinforce challenges of governance (Bohle/Sakdapolrak 2008, Heinrichs et al. 2012, Kraas et al. 2019).

The situation described above also applies to the greater region of Southeast Asia, where accelerated urbanization processes (in various countries with a time lag) began to take hold increasingly from the mid-1980s onwards. The percentage of urban population in Southeast Asia rose from 15.6% (1950), 25.5% (1980) and 37.9% (2000) to 44.3% (2010) and 50.0% (2020), that of Myanmar even more strongly since the 2011 opening policy, namely from 16.2% (1950), 24.0% (1980) and 27.0% (2000) to 28.9% (2010) and 31.1% (2020) (WUP 2018).

Myanmar – which is in the focus of the research project – is located in a natural hazard-prone area. The Sagaing fault line runs through the middle of the country and is known for its high seismic activity and for frequent earthquakes (Thein et al. 2009). The three most important (mega)cities Yangon, Mandalay and Nay Pyi Taw are located directly on the Sagaing fault line, many regional cities Taunggyi and Mawlamyine are situated on side fault lines (Kraas et al. 2017). Myanmar also is highly exposed to tropical cyclones, which develop in front of the coastal areas by (pre- and post-)monsoonal divergent air masses from land and ocean origin. Tropical cyclones reach the coasts with high velocities and can penetrate deeply into the country. Within the last 15 years, Myanmar was affected by five very severe tropical cyclones: Nargis (May 2008), Giri (Oct 2010), Komen (Aug 2015), Maarutha (May 2017) and Bulbul (Oct

2019), causing devastating damages and casualties (UNOCHA 2017; Brakenridge et al. 2017, Brill et al. 2019). Lack of proper information and knowledge on preparedness led to high number of victims. Many communities were not aware of the danger of the cyclone. Initiatives for increasing institutional preparedness only started after „Nargis” in 2009 (Than et al. submitted). Since early 2020, Myanmar is affected by the global Covid-19 pandemic. Government institutions, educational and private organization are obliged to work at home and have reduced working times. Private businesses were either completely closed (29%) or reduced operations and customers (48%) (Chau 2020), which is highly impacting the Myanmar economy and peoples’ livelihoods.

With more than five million inhabitants, megacity Yangon is the largest city of Myanmar. It was capital until 2005 and is today’s leading economic hub. Since the country’s opening-policy (2011), Yangon is undergoing deep transformation processes; globalisation further accelerates urbanisation (Kraas 2019). International investors support high-rise buildings and manufacturing industries; most of the country’s largest industrial zones are located around Yangon, thus the economy is at risk through increasing primacy (Kraas et al. 2017).

After the catastrophic cyclone Nargis (2008), legal frameworks and institutional restructuring were initiated: Every township is now obliged to have a disaster management committee (NDMC/ Republic of Myanmar 2017). Data from the project’s definition phase, though, show that the horizontal governance needs to be strengthened for an improved

risk management (Figure 1). An efficient provision of resources and proper coordination is needed for the development of appropriate preparedness concepts and strategies to build back better after a disaster (UNISDR 2017). Good practice examples from projects on national level show that the combination of databases and institutional capacity building is strengthening risk management – as proven, e.g., by the comprehensive country-wide database “Myanmar Unified platform for Disaster Risk Application (MUDRA)” (<https://www.mudra-ddm.info/>). A systematic detailed knowledge base for urban areas in Myanmar, with integrative, long-term, comprehensive concepts and a society-based implementation of multiple risk management is lacking so far.

1.2 Strengthening disaster risk preparedness and knowledge exchange

In 2019, the National Disaster Management provided guidance on actions to raise awareness, increase preparedness and response capacities for earthquakes by the National Earthquake Disaster Response Plan (NDMC/UNDP 2019). The document was adapted to the Yangon Region by clarifying responsibilities in case of risk mitigation and risk communication strategies (MoSWRR et al. 2019). A focus is on awareness raising programmes on earthquakes, which is already implemented by national organisations such as the state-owned media MRTV (own article in process). There is an urgent need on the publication and implementation of action plans on other natural and human-made hazards, especially adapted to the regions and states of Myanmar.

Study results of the previous project phases have proven a lack of awareness for natural disasters and preparedness measurements in the civil society (households and individuals). Awareness raising campaigns on natural hazards have diverse outcomes in terms of self-protecting behaviour and differ in their efficiency (own article in process). Interactive awareness raising methods, such as contests of question-answers appeared highly effective in increasing risk perception and knowledge (Bodoque et al. 2019). However, this results highly depend on cultural, socio-economic, educational, and political backgrounds. There is a “gap between awareness and the performance of preparedness activities” (Than et al. submitted). Thus, the impacts on awareness raising programmes need to be evaluated. This allows the development of guidelines on locally adapted awareness raising, which shall be inclusive, multilingual, easy to understand and target- and group-oriented (Lafrenière/Walbaum 2017; BMZ 2013).

It is necessary to evaluate and improve the efficiency and the outcome of awareness raising programmes in Yangon. The development of adapted programmes deserves resilient institutions at city and township levels including institutional flexibility to a certain extent, institutionalised processes of internal education and room for development, and standards in disaster risk management strategies (Rehak 2020). For the adequate communication of risks, decision-makers on natural hazards management need to have adequate knowledge on the perception of natural disasters and the sensitivity of the general public for an early recognition of natural hazards and adequate measures to broaden the general knowledge about earthquakes, tropical cyclones, diseases and flooding (Carius/Renn 2003). The acceptance for risk mitigation and prevention measures by the general public depends on the trust in decision-makers (Bronfman et al. 2016; Han et al. 2017; Terpstra 2011). Especially at lower

administrative levels, competent and quick actions may prevent damages and can de-escalate conflict potentials (Renn 2008).

Mass media play an important role in disaster risk perception and risk communication (Cheng et al. 2016). Thus, in Yangon, mass media and digital solutions shall be approached for digital learning and prevention tools (MoSWRR et al. 2019). As a lack of research in the field of the use of apps and social media for disaster risk reduction and prevention is evident, research on the digital transformation of disaster management is needed. The preliminary project phases revealed, that large and relevant disaster risk reduction (DRR) data sets in Myanmar and Yangon exist, including geo-data sets, demographic data sets, survey data, and other data from DRR-relevant projects (e.g. the project on “Strengthening Climate and Disaster Resilience of Myanmar Communities” by the Department of Disaster Management of the Ministry of Social Welfare, Relief and Resettlement and the ADB, funded by the Canadian Government). These are highly important for an adequate disaster response and could serve as basis for disaster preparedness initiatives and modelling (Malawani et al. 2020). However, there is, first, a need of capacity enhancement in using and modelling the data. Second, the data does not reach out to the wider public, namely active members of the civil society. The compatibility of existent data sets is not proven and data management tools are not implemented at administrative levels. For a better coordination and allocation of resources in disasters risk management, proper data management is essential.

Micro-, small- and medium-scaled enterprises (MSME), such as food and water vendors and private medicinal and pharmaceutical facilities, play a crucial role in Yangon for the provision of the urban critical infrastructure. Since there are no adequate auditing tools for the disaster preparedness of buildings and MSMEs and since insurances are rather uncommon in Yangon, MSMEs in natural hazard prone areas are highly vulnerable (Isa/Mangifera 2019). Their total loss or temporary closing does not only affect the MSME owners and their employees, but have negative affects to the livelihood of township residents. In particular, medicinal and pharmaceutical facilities are expected to provide aid and quick response in case of disasters (Top et al. 2010). System-relevant MSMEs deserve contingency management plans and proper auditing tools to decrease their vulnerability for disasters (Verbano/Venturini 2013). This holds true also for official buildings of the city administration and other institutions, such schools, universities and hotels, which play a role as refuge in disaster response. In the Myanmar context, religious facilities play an eminent role as rescue shelters.

In 2020, Yangon and Cologne have been and are both highly, but in very different ways (e.g. in respect to the number of affected population, health system preparedness, economic resources), affected by the Covid-19 pandemic. The rapid digitalisation of workflows and

processes, the shortage of time for transitions and the implementation of prevention measurements are leaving damages in economy and they affected the trust of civil society in administrative institutions. In the current time and opportunity to build back better the damaged infrastructure and to gain back trust of the civil societies, both cities are in equal need to develop future-oriented solutions of urban disaster management. Both cities are already highly benefitting and will benefit in future from a close exchange on management processes of the pandemic, from synergy effects of solution strategies for similar problems and a joint exchange platform to generate innovative concepts for a more sustainable handling of multiple risks. Yangon is benefiting from the knowledge and experience about operational procedures and solutions in Cologne, Cologne is learning from the creativity of self-organisational capacities and intercultural experience in the civil society, partly informal processes of Yangon.

1.3 Achievements of the project's initial and definition phases

During the project's initial and definition phases (11/2017 to 4/2018 and 9/2019 to 2/2021), the following results have been achieved:

- (1) A first **digital knowledge and literature data base** was created with the online-based literature management platform Zotero®. It contains scientific literature from **comprehensive literature reviews** on major project-relevant topics of, e.g., disaster risk awareness, preparedness and management, risk communication, MSMEs and contingency strategies. Also, guidelines, statutes and laws on DRR, links and reports of important projects within the scope of DRM, project-relevant newspaper articles of Yangon and Myanmar, and examples and guidelines on good scientific practices were included. The data base is accessible for all project partners and is fed constantly with relevant current publications.
- (2) A first concept for a **metadata inventory on existing databases** was established with metadata from DRR-relevant statistical and GIS data from several projects and information on data matching and harmonisation. Furthermore, several contact partners on DRR projects have been collected/mapped.
- (3) The basis for a **qualitative and quantitative data pool** was established: Already **42 semi-structured interviews** were conducted (18 during the definition phase and 34 during the definition phase, until 20.4.2020) from township officers and members of the townships' disaster management committees in order to assess the state of the critical infrastructure and the work of risk-related governmental institutions. Lessons learnt from Nargis and institutional preparedness on risk communication and critical infrastructure have been recorded. In five household surveys, lessons learnt from Nargis, risk perception and communication of natural

hazards and the safety of personal data were collected in eight townships in Yangon (total respondents: 896 households). Another survey investigated critical infrastructure and public preparedness in four townships (about 440 households). In Cologne, online-based surveys on Covid-19 lessons in Cologne were conducted (about 1,200 questionnaires). A survey on contingency strategies of small- and medium-scaled enterprises in Cologne were prepared by the Fire Department of the City of Cologne (AFRB). For the Rhine River, a survey was carried out for tenants and owners of houses in flooding areas to understand their protection against flooding; questionnaires were also sent to experts (StEB Cologne). By the end of the definition project phase, **data from about 2,000 households** will be collected, analysed and the result provided to the local project partners for usage.

(4) Seven **teaching courses** on urban risks research, individual and private sector risk preparedness were taught in Yangon and Cologne (partly jointly, incl. long practical field work).

(5) Nine **Bachelor- and Master theses** and one **doctoral dissertation** have been finished or are in progress.

(6) Two **scientific articles** have been accepted for publication (Yangon University Research Journal, Myanmar Academy of Arts and Science), two are close to submission.

(7) **Stakeholders of disaster risk management** were **mapped**, resources and deficits detected. After Nargis the National Disaster Management Committee (NDMC) was installed which vertically organises Disaster Management committees at (a) state/regional, (b) district, (c) township and (d) village and ward levels. The analysis discloses gaps in collaboration, information flow and risk communication.

(8) Three **international conferences**, in Yangon, Cologne and Berlin, with high-ranking attendance (with mayor, deputy mayors, international experts, all project and observation partners), **eight workshops** (among them one during the national symposium on disaster risk reduction of the German Red Cross 2019; a next will take place in Oct. 2020) and numerous bi- and multilateral project meetings have been conducted.

(9) **Three capacity enhancement trainings** for YCDC and MEI were provided on urban flood protection by StEB Cologne, DKKV and UoC.

(10) **Five flyers on DRR topics** (on tropical cyclones, flooding, earthquakes, evacuation and Covid-19, in Myanmar and English language),

(11) The project **homepage** and a **project pamphlet** were jointly developed.

(12) The **founding** of the **transdisciplinary research institute** ("Institute for Protection and Rescue", Cologne Fire Department) in July 2020 is directly connected with the research project.

2 Aims and approaches of the R&D phase of the MYrisk project

The transdisciplinary German-Myanmar research project aims to establish a sustainable management of multiple risks in extreme events for the example of the megacity Yangon on the basis of integrative, holistic approaches of modern risk research. Theoretically and conceptually, the management of multiple risks is understood as a central sub-process of the adaptation of complex systems (Birkmann et al. 2010, Butsch et al. 2016) in the course of an urban transformation towards sustainability (WBGU 2016). The research results, findings and approaches gained for Yangon will be made applicable to other major cities in Myanmar; a basic transferability to other cities will be designed. In long-term, multilateral cooperation between research and application institutions in Cologne, Yangon and four major cities of Myanmar, comprehensive concepts of risk management and disaster prevention are to be developed and mutual knowledge transfer facilitated.

In line with this overarching project goal of the BMBF's "Sustainable Development of Urban Regions" (NUR) programme, the **objectives** of the 48-months R&D project phase are: (1) Establishment of a systematic **metadata inventory** for the bundling of existing data stocks for use in holistic risk management, (2) Development of a **concept** for efficient **institutional risk prevention, cooperation and communication** between the central actors (government, administration, science, institutions, private sector, civil society), (3) Concept and design of inclusive and culturally sensitive **risk prevention programmes for civil society**, with measures for awareness and education about natural and anthropogenic risks and for individual precautions (e.g. against the loss of personal documents), (4) Conception or improvement of operational precautions for **system-relevant** small and medium-sized **enterprises** to secure critical infrastructures, with a focus on system relevant services, such as private clinics, food and water providers, (5) Creation of a **dialogue platform** for innovative, future-oriented and sustainable "build back better" strategies for the Covid-19 pandemic.

The core components will run parallel and in close exchange between the Myanmar and the Cologne partners (Figure 2).

The project is based on a high frequent exchange of the two countries' partners. In total, the project contains seven work packages (WP):

WP 1: Establishment of a metadata inventory of existing data stocks

A comprehensive collection and source analysis of existing data stocks will be carried out. All source information about data sets on previous disasters, such as DMR-relevant geodata sets, DRR-project data from previous and current projects, contact data, etc. will be collected. Data

stocks will be authenticated and if possible normalised. The data sets will be stored according to the data warehouse principle (Inmon 2005; Kimball/Ross 2013). Creating a data stock overview and checking it for harmonization and joint uses strengthens the institutional preparedness and fosters their data exchange, which goes in line with the Humanitarian Data Exchange-principles (UNOCHA n.d.). The work package consists of three objectives: 1a data acquisition; 1b data provision; 1c data normalisation.

WP 2: Development of a concept for institutional risk preparedness, cooperation and communication on DRR

WP 2 focuses on (a) establishing a national city network and knowledge exchange on DRR, (b) the elaboration of an institutional risk communication framework and (c) the provision and knowledge exchange on DRR between Germany and Myanmar (and beyond). Regular conferences in DRR, workshops and webtalks shall ensure exchange between the DRR-involved central actors (government, administration, science, institutions, private sector, civil society) and foster an atmosphere of mutual trust for joint collaborations. A guideline on an inclusive, multilingual disaster risk communication, which includes the principles of “Leave No One Behind” shall be jointly elaborated.

WP 3: Concept and design of inclusive, culturally sensitive risk prevention programmes for civil society (awareness, education; precautions against loss of personal documents)

WP 3 has four objectives: (a) The development and evaluation of efficient, inclusive and culturally sensitive risk prevention programmes are planned, which are locally to Yangon.

People with special needs shall explicitly be included into DRR prevention and response activities. (b) The analysis of the use of digital media and apps for disaster response and preparedness shall be scientifically invented and evaluated. Digital transformative processes in DRR activities shall be outlined and the outreach and inclusiveness of digital media in DRR evaluated. (c) The informal flow of information and the involvement of volunteers by digital media and civic organisations in preparedness activities shall be assessed. A guidance on awareness raising campaigns and strategies shall be jointly elaborated. (d) The StEB Cologne has developed a new online tool for Cologne: the Water Risk Check. With this tool people get answers and protection measures, if there wanted to know: How do I protect my building from flooding? Why do I have water in the basement and what can I do about it? Am I protected from flooding? After entering an address and completing a digital questionnaire, the tool evaluates the hazard potential and provides guidance on which object protection measures are suitable to protect yourself against water hazards or to reduce the risk. In the research and development phase of the project, the possibility of adapting this tool to Yangon will be investigated. After successful adaptation, the tool will be disseminated in Yangon.

WP 4: Conception of operational precautions for system-relevant small and medium-sized enterprises (MSMEs) to secure critical infrastructure

A (a) risk assessment of natural and anthropogenic risks for private clinics and pharmaceutical shops shall be conducted. Strategies and auditing concepts for the improvement of their preparedness shall be developed. Case-studies shall be carried out and selected MSMEs piloted. b) System-relevant official buildings – such as city administration, universities schools and private sector units – shall be audited for evacuation concepts and evaluated to their resilience against multi-hazards risks. Scenario-based evacuation concepts and auditing guidelines shall be developed and adapted to Yangon.

WP 5: Establishment of an exchange platform of future-oriented, sustainable “built back better” strategies for the Covid-19 pandemic

WP5 shall create a platform to provide study results (a) on transformation processes in urban mobility, supply and home office work in Yangon and Cologne in time of Covid-19. The (b) institutional preparedness and disaster risk management in case of the pandemic in Cologne and Yangon shall be analysed and (c) a dialogue platform for knowledge exchange and transfer for “built back better” strategies after Covid-19 will be established.

WP 6: Communication and Dissemination

Research results of the consortium will be communicated continuously to different audiences and disseminated through scientific and target-audience focused publications. The project

homepage will continuously be updated with project news. Seventeen publications are planned to be produced on the achievements and results of the project in order to contribute to the current scientific discourse on urban disaster risk management, urban transformation to sustainability and digital transformation processes in DRR.

WP 7: Coordination

The coordination of the project includes, e.g., project management, preparation of meetings, conferences, control of finances, good project communication, regular reporting, communication with the funding agency and internal documentation.

3 Relation of the proposal to the development of sustainable urban regions (NUR)

The project proposal aims at contributing to scientific conceptual and application-oriented knowledge on urban transformation to sustainability – in focusing on Yangon and four large cities in Myanmar as examples of multiple risks-prone (mega)cities in Southeast Asia. Both, aim and geographical focus are in line with the BMBF call. The development of locally adapted DRR concepts to increase the resilience of local governance are at the core of the project. Close and trustful collaboration between local administration, research partners, private sector and civil society constitutes the project. The project proposal is in line with the German internationalizing strategy of the new urban agenda and with the SDGs 11.5 (reduction of casualties and economic losses by disasters by 2030), SDG 11.7b (referring to the Sendai Framework for DRR 2015-2030 and the establishment of holistic disaster risk management strategies by 2030 (UN 2015b; 2015a). Furthermore, the project addresses several targets of SDG 17 (establishing global partnerships and the exchange of knowledge and capacity building).

4 Methodological framework

4.1 Methodology

The project's focus on multiple risks management in (the example of) Yangon. As both Yangon and Cologne have to cope with natural and anthropogenic risks, such as flooding and pandemic, disaster risk management strategies can be contrasted and mutual benefits from synergy effects are welcomed. Further large Myanmar cities are thus observing partners benefiting from outcomes and outputs of the research project.

Given the transdisciplinary character of the project, a mixed-methods research approach was selected (Kuckartz 2014; Flick 2011), further awareness raising measurements will be evaluated and adapted.

- *Comprehensive literature reviews* on the focal topics will be carried out and integrated in the literature and knowledge database. Predefined keywords will run through the literature databases of Web of Science, Google Scholar, Scopus and ResearchGate (Khan et al. 2003). All collected literature will be reviewed and added to the literature and knowledge database which serves as resource basis.
- *Eleven Workshops* on natural and anthropogenic disaster risks management, data warehouses and data availability, awareness raising measurements and volunteer acquisition, digitalization in disaster management, evacuation, risk communication guidelines and wording will be carried out to foster the knowledge exchange between institutions and to create space for developing and discussing new concepts on disaster risk management. The workshops will be conceptualized with participating methods to generate a interculturally valuable outcome. Methods like world-café-, fish bowl and brain storming will be culturally adapted and applied.
- *Four international conferences* will be organised on recent results of the project and DRR related topics. The international exchange on DRR shall strengthen the trans- and interdisciplinary exchange at national and international levels. Two conferences each will be held in Yangon and in Cologne (in case of prolonged Covid-19 restrictions, they will be substituted digitally).
- *Nine webtalks* of about 60 minutes each will be conducted as new digital method for dialogue-based capacity enhancement. After the 15 to 20 minutes input talks, the digital meeting's participants can pose questions to the experts in a question and answer (Q&A) session. The webtalks will be recorded and edited and the resulting educational videos provided to a larger audience.
- *Event-based trainings and drills on disaster prevention* will be conducted. Previously selected pilot townships will conduct preparedness activities. Participative and inclusive training methods will be applied. According to the principles of an inclusive DRM, special needs of vulnerable groups will be assessed and the drill and trainings will actively include people with special needs (BMZ 2013). Assessment tools like the Washington Group-short set questions will help to assess the needs of persons (UKaid and Handicap International 2019). *Participatory rural appraisal methods (PRA)* will be applied to teach and to evaluate the drills and trainings (Chambers 1994; Kirsopp-Reed 1994; Francis 1994). The training

and evaluation methods for the civil society should be attractive and funny. A positive association with preparedness trainings for the civil society should be achieved.

- *Questionnaire-based surveys* will be conducted for data collection. A stratified random sampling method will be applied within city townships and wards as strata (Figure 3). Additionally, *Online-Surveys* with the LimeSurvey Software® (<https://www.limesurvey.org>) will be carried out to collect quantitative data on awareness raising measurements, contingency strategies of small-businesses etc. The quantitative data will be descriptively and analytically analysed with IBM SPSS®
- *In-depth interviews with key informants, such as experts, and problem-oriented interviews* (Bernard 2006; Flick 2011) with selected households will be conducted, also to collect data and to map communication chains. A semi-structured interview guide will be elaborated in advance. The interviews will be held in the local language of the interviewee, which can either be Myanmar or minority languages or German, sometimes in English. All qualitative data will be audio recorded, transcribed and translated to English. The data will be analysed with MaxQDA® (<https://www.maxqda.de>) by inductive and deductive coding.

4.2 Data treatment and re-use

Primary and secondary data collected by the project will be shared between the project partners according to the rules of the good scientific practice (DFG 2019b). Informants' and interviewees' names will be anonymized (DFG 2019a). Participants can withdraw from studies at any time and have the right to claim for deletion of their personal or specific data within six months after data collection (RatSWD 2018). The data will be published mainly in scientifically reviewed journals and distributed to experts by presentations at conferences. Information on events and new publications will be announced on the project homepage.

After the end of the R&D project phase, data will be stored for ten years in a data repository of the UoC with restricted access in accordance with international standards of good data handling (RatSWD 2018). Only the project lead is allowed to provide access to the anonymized data and is able to allow its re-use by third parties and externals.

5 Cooperation and Distribution

The project relies on a close collaboration with inter- and transdisciplinary, local institutional and private partners. The UoC will take over the project lead (L), while the StEB Cologne, the AFRB and YCDC will act as cooperation partners (K). There will be active project partners (Unterauftragnehmer U) and observing partners (O) from four other large Myanmar cities.

The high number of different institutions is challenging in terms of intercultural communication and transdisciplinary collaboration, international and political aspect as well as the interdisciplinarity approach. Due to the already established trustful communication atmosphere between all project partners, the project is building a bridge between Germany and Myanmar and contributes to the prolongation of a trustful dialogue between the two countries (Figure 4). Prof. Dr. Frauke Kraas is leading the consortium. She is working in Myanmar since 1996, has conducted several large research projects on urban transformation in Southeast Asia and Myanmar, multiple post-disasters, e.g. tropical cyclone “Nargis” in 2008 (Kraas/Yin May/Zin Nwe Myint 2010; Kraas 2008, 2009). She (co-)authored several research publications on Myanmar (CV in Annex 1), is international advisor and visiting professor at the University of Yangon (resident from 2012 to 2014) and co-chairs the Myanmar German Research Centre (MGRC) at DUHD/MoC and the Centre of Excellence for Urban and Regional Development (CoE) at the University of Yangon.

Project partners

K01 - University of Cologne (UoC), Institute of Geography (Annex 1, 2)

K02 - Flood protection centre of the municipal drainage operation of the city of Cologne (StEB Cologne) (Annex 2)

K03 - Fire Department of the City of Cologne (AFRB) (Annex 2)

U04 - The German Committee for Disaster Reduction (DKKV) (Annex 2)

U05 - Yangon City Development Committee (YCDC) (Annex 2) and Yangon Region Government (YRG). YCDC will act also on behalf of the YRG, which is responsible for the governance and administration entire of the Yangon Region. Among its main tasks are regional planning, land administration, drawing and implementing land policies, regulation of construction sites, traffic management, environmental protection, disaster and risk management and provision of water supply (<http://www.ycdc.gov.mm/>).

U06 - Department of Urban and Housing Development (DUHD), Ministry of Construction (MoC)
University of Yangon (YU) - financially covered under the MoE (see U11)

U07 - Myanmar Environment Institute (MEI) (Annex 2)

U08 - Pastoral emergency care (NFS) is focusing on supporting people and institutions in emergency needs through means of psychological support, exchange and professional relief action.

U09 - ICLEI South East Asia

U10 - Hotel Resilient

Observing partners

The observing partners will be involved in the project as observers. They will be invited to the conferences, workshops etc. and to webtalks. They are:

U11 - University of Mandalay (MU) and the Taunggyi (TU) and Mawlamyine Universities (MLMU). The Ministry of Education (MoE) is their umbrella institution.

O12 - Nay Pyi Taw City Development Committee (NPTCDC)

O13 - Mandalay City Development Committee (MCDC)

O14 - Shan State Government (SSG) for the city of Taunggyi, the capital of Shan State.

O15 - Mon State Government (MSG) for the city of Mawlamyine, the key hub to the Myanmar south. MSG acts as administrative body.

6 Expected results and potential for application

6.1 Prospect of economic success

R&D projects do not pursue economic interests. Some of the outputs bear economic potential.

(a) The planned edited educational films from the webtalks recordings could be used for commercial purposes of digital blended learning to qualified personnel in the DRR sector. Capacity enhancement is one of the overarching aims of the project as the educational and qualification system of the country leaves space for improvement. Digital formats for qualification can reach out to a far higher number of people than face-to-face formats. Planned webtalks with the output of educational films will be produced for the following topics: (1) Digital tools for communication, education and qualification, (2) Good practice: awareness raising campaigns, (3) Evaluation of awareness raising campaigns, (4) The data warehouse concept, (5) Evacuation framework Germany, (6) Good practice: Volunteer systems, (7) Build back better after Covid-19, (8) Build back better - future strategies, (9) MYrisk - results and achievements. (b) The assessment of the resilience level of hotels against multiple risks could in future bear an economic potential (by the company Hotel Resilient as our partner).

6.2 Prospects of scientific success

Seventeen national and international publications are planned and project results will be presented at workshops and conferences in order to contribute to the international scientific discourse about disaster risk prevention and risk communication. Among them will be four guidelines on a) institutional risk communication (P10), b) on awareness raising campaigns in DRR (P13), c) on auditing buildings (P16), d) the Water Risk Check online tool (P17). They will provide DRR frameworks for Yangon and Myanmar with political impact and will improve the local and national disaster risk management. The 17 planned publications will focus on (partly on Yangon, partly on Cologne, some with focus on basic principles): Systematic literature review on digital media and app use for DRR, Urban transformation due to Covid-19, Natural disaster risk assessment for private clinics, Pandemic preparedness, Institutional wording and flow of communication, Digital transformation of DRR measurements Yangon - User group of apps for disaster risk alerts, Improving multiple risks management in Covid-19 times, Disaster risk assessment and risk reduction for small-scaled pharmacies and private clinics, Data warehouse approach for DRR, Guideline on risk communication and DRR wording, Evaluation of awareness raising campaigns, The role of civil organisation in disaster management, Guideline on DRR awareness raising campaigns, Incentives for volunteering for

disaster preparedness (including reach out to people with special needs), Build back better strategies after pandemics, Guideline on auditing buildings for multiple risks, Guideline how to make, to use and to install an online tool Waster Risk Check.

6.3 Scientific and economic connectivity (“Anschlussfähigkeit”)

In the current political transformation process, intersectoral and international collaboration and communication are politically wanted but still not yet fully implemented. Frameworks for achieving the goals of the Agenda 2030 and the Sendai Framework are partly existing, but require adaptation in the political transformation process. The project supports the opening strategy of the country and strengthens the connectivity of the country to global standards and goals. By its planned activities and its key role in transdisciplinary and intradisciplinary work (Figure 4), the project connects the institutions of important Myanmar cities to international stakeholders and to bilateral Myanmar-German networks.

Eleven workshops will be conducted to jointly elaborate on the joint aims: One day kick-off workshop of phase II in Yangon, one day kick-off workshop of phase II in Cologne, one/two days on elaboration of awareness raising campaigns, one/two days on elaboration of a risk communication framework, Two days on evacuation framework adaptation to Myanmar, Two days training and experts exchange on the use of the meta data ware house, one day on integration and resource allocation of volunteers in disaster management, two days elaboration of an auditing guideline for buildings, one day Workshop on scenario-based resilience evaluation auditing processes for MSME buildings, one day Water Risk Check online tool.

7 Timeframe and finance plan

7.1 Schedule for the R&D phase (48 months)

The project is conceived for 48 months and consists of seven work packages (WP) (see large three page table 1 below). Every six month, the project will be internally checked for quality and progress. (C = conference, D = Drill/Training, F = educational film, P = Publication, S = Survey, W = workshop, Z = webtalk).

Months 1-4: The following work will be conducted: two kick-off-workshops (W1/W2) in Yangon and Cologne (alternatively in digital format); data acquisition for the development of a data inventory; conduction of a webtalk and edition of an educational film on training concepts (Z1/F1); development of a concept of the awareness raising programme; literature review on

the use of digital media and apps for DRR with publication (P1); collection of secondary data on private clinics and pharmaceutical shops in Yangon, survey on their impact in case of natural disasters (S1).

Months 5-10: Envisaged work: literature review on institutional DRR wording and communication chains; collection of qualitative and quantitative data on urban transformation in times of Covid-19 (S2) for a publication (P2); setting of the technical infrastructure for the development of the data inventory; conduction of a workshop on awareness raising campaigns and wording (W3) for the provision of outcomes on the following awareness raising campaigns and events for the civil society; conduction of a webtalk and film (Z2/ F2) on best-practices of awareness raising campaigns; development of a methodology for evaluation of awareness raising campaigns including games and drills (D1/D2); partner acquisition of civil organisation for the awareness raising campaigns. Conduction of an international conference on DRR in cities in Yangon (or digital format) (C1); study designing of the assessment of the use of digital media apps for disaster response; webtalk on pastoral emergency care in Germany (Z9/F9) analysis and publication of the collected data on private disaster-relevant small-scale enterprises (P3); publication of the data on pandemic preparedness in Cologne (P4).

Months 11-16: The following work will be done: submission of the status report; data acquisition and presentation to the Myanmar experts by a webtalk (Z3/F3); data provision by setting the data inventory; conduction and evaluation of the first awareness raising campaign in two selected townships, survey and interviews on the flow of information on disasters and wording in civil organisation (S3); collection of data on the digital transformation in disaster preparedness in Yangon (S4); publication of collected and analysed data on communication flows and wording (P5), conduction workshop in Yangon in order to elaborate a guideline on risk communication and wording (W4); analysis and publication of data on app user groups (P6); workshop on the adaption of religious emergency care to Yangon (W11); scenario-based risk assessment for selected private clinics and pharmaceutical shops; study designing on disaster management of Covid-19 in Yangon.

Months 17-23: This work will be performed: conduction of the second international conference on DRR in cities in Cologne (C2); final setting of data inventory and data normalization; test of data inventory requests; preparation of trainings on the data inventory use; elaboration of a risk communication guideline; evaluation of the first phase of awareness raising campaigns; adaptation of the campaign design according to the evaluation; publication of the data on the disaster management of Covid-19 in Yangon (P7); presentation and adaptation on the tool

Water Risk Check in and to Yangon (W10); publication of the data and risk assessment on the small-scaled pharmacies and private clinics (P8); development of scenario-based evacuation concepts for buildings; webtalk on good-practice examples (Z4/F4); two-day workshop (W5) for developing an evacuation concept for two selected pilot buildings; development of evaluation methods of the evacuation concepts; conduction and evaluation of evacuation drills (D3/D4); selection of pilot buildings MSMEs for the assessment and evaluation of their multi-hazard resilience; adoption of multi-hazard risk evaluation concepts and protocols for scenario-based resilience performance of MSME buildings based on the local characteristics and urban setting in Yangon(S5); initializing webtalk on the establishment of an expert knowledge exchange on build back better strategies after Covid-19 webtalk (Z5/F5).

Months 24-28: This work is planned: second project status report to be prepared and submitted; Conduction of the second phase of awareness raising campaigns in two selected townships of Yangon (D5/D6); webtalk on outcomes on the past workshops W3 and W4 and evaluation of the first awareness campaigns (Z6/F6); workshop (W6) on training and development of using of the metadata warehouse with publication (P9); finalisation of the guideline for risk communication and wording finalized (P10) and results of the Water Risk Check tool (P 17); selection of small-scaled system relevant enterprises for the participation in the second evacuation drills and the evacuation concepts adapted to their buildings (S6).

Months 29-34: This work will be conducted: third international conference on DRR in cities in Yangon (or alternative digital format) (C3); re-evaluation of the awareness raising campaigns (S7) and publishing of the results (P11); Mapping of the resources of civil organisations, with publication (P12); conduction and evaluation of the second piloting of evacuation concepts for buildings (D7/D8).

Months 35-40: This work is planned: preparation and submission of third project status report and start of joint preparation of the proposal for the application of the implementation phase; Establishment of a guideline on basis of results of the awareness raising campaigns (P13); workshop (W7) on the integration and resource allocation of volunteers in disaster management as initial point of the development of a volunteered disaster management concept; re-evaluation of the evacuation concepts (S8); development of the build back better strategies and presentation of results in a webtalk (Z7/F7).

Months 41-46: This work will be conducted: finalisation and submission of the proposal for the implementation phase; finalisation of the assessment for volunteering incentives (S9) with analysis and publication (P14); drafting and finalisation of the auditing process for buildings in

a workshop in Yangon (W8); workshop on scenario-based resilience evaluation auditing processes for MSME buildings (W9); publication of build back better strategies from the expert network (P15); webtalk on the achievements and outlook of the project (Z8/F8).

Months 47-48: This work is planned: preparation and submission of the final report and the last project status report; concluding conference on DRR in cities with project results in Cologne; finalisation and publication of a guideline on auditing buildings (P16).

7.2 Finance plan

The overall cost sum up to 1.713.853 €. Thereof, 468.196 € are dedicated for the cooperation partners StEB Cologne and AFRB, while 345.313 € are dedicated for national and international subcontractors. 692.734 € will be needed to cover the costs of the UoC and 207.609 € are calculated as overhead (Table 1 and 2).

The foreign partners will not be able to contribute any funds. But they will contribute indirectly and strongly with the provision of office space (already established and functional in YCDC and MEI) and with the assignment of own staff during the entire funding period. Their contributions cannot be measured adequately in € and are thus not listed in the financial overview.

7.3 Time frame for the implementation phase (24 months)

Currently, it is unrealistic to present a time frame for the implementation phase (as there will be elections in Myanmar on 8.11.2020 and the progress of the Covid-19 pandemic is open). All concepts developed in the R&D phase will be implemented in Yangon and will be transferred to the further four cities. The evaluated awareness concept from the R&D project phase shall be applied and conducted in at least eight further townships of Yangon and its regular refreshing will be implemented. The cities of Nay Pyi Taw, Mandalay, Taunggyi and Mawlamyine, which have been observing the project so far, will be actively included into the implementation phase. Experts from these cities shall be trained to adapt and implement the concepts to their cities and townships. The auditing of important buildings in Yangon will be established on basis of the guideline. The knowledge exchange on the use of the data inventory will be continued. The actors of the established city network will continue meet regularly. At least two conferences will be held in Yangon.