COMPLEX PROJECTS
CRISIS HUB

RESEARCH REPORT

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complex CP projects

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BERLIN-TEGEL
Deutsches
R tes
Kreuz


IFRC
IFRC
BANGLADESH RED CRESCENT SOCIETY
BDRCS

INDEX

INTRODUCTION

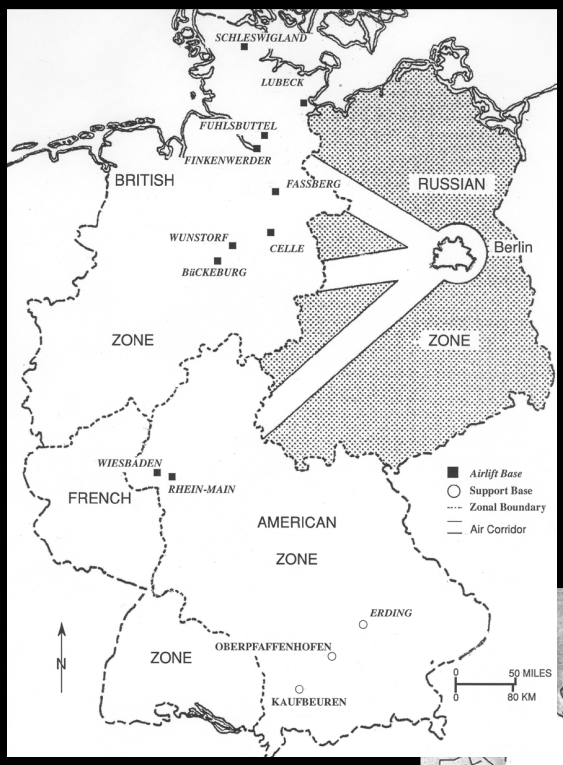
01

THESIS TOPIC

In the context of humanitarian air relief operations, the Berlin Airlift in 1948 consisted of the world's largest ever air supply. During that year, 2.223.000 tons of food, fuel, and supplies were transported to Berlin in more than 226,600 flights (Grehan, 2019). This amounted to a total of 5.000-8.000 tons delivered per day and a plane taking off or landing in West Berlin every 30 seconds (History.com Editors, 2020). In the aftermath of World War II, Berlin, despite being located within the Soviet Zone of German territory, was divided into an Eastern zone occupied by the Soviets and a Western zone divided between the English, French and American. In this context, the blockade of Berlin by the Soviets consisted of the first crisis during the Cold War period.

From an infrastructural point of view, the Berlin Airlift had clear impacts to the city. Most importantly: the construction of the Tegel airport in only 93 days. The Tempelhof airport, located in the American sector, did not have enough capacity to deal with the inflow of goods during the airlief, which prompted the need of a new airport. The construction of the Tegel airport initially consisted of a 5,500-foot runway with 500-foot overruns on each end, as well as a 2,200 x 400-foot apron. Its construction counted with the help of the civilians in the city, with a very strong presence of women, which constituted more than half of the 17.000 people workforce. The construction materials utilized included tons of rubble remaining from wartime air raids. (Harrington, 2008).

Almost 80 years after the Berlin Airlift, the world faces an increasing demand for humanitarian assistance. The need for humanitarian relief operations has more than doubled in the past 5 years, from 132 million people in need of humanitarian assistance in 2019 to 339 million people in 2023 (Development Initiatives, 2023). The relief operations organized during the same period, have only been able to target,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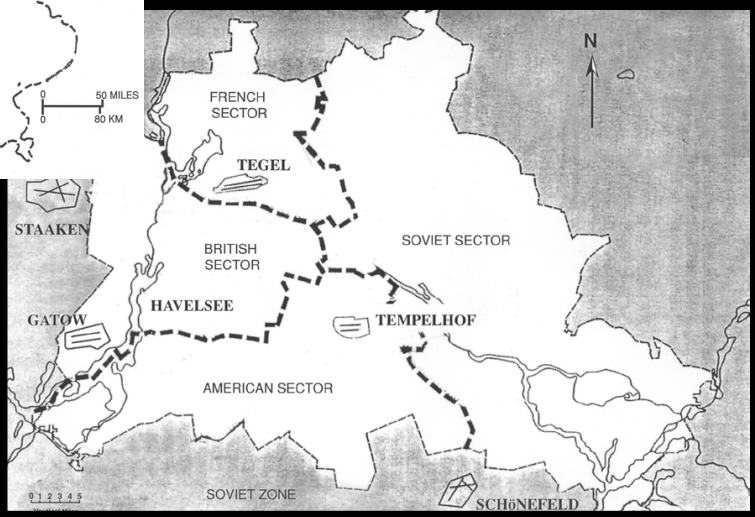
Support Base
Zonal Boundary
Air Corridor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AMERICAN SECTOR
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SCHÖNEFELD
0 1 2 3 4 5

on average, 65-70% of all demand for humanitarian aid. Moreover, the predictions by the United Nations (UN) in the Global Humanitarian Overview, have been proved to underestimate the number of people in need of humanitarian assistance (OCHA, 2018; OCHA, 2019; OCHA, 2020; OCHA, 2021). Notably, in 2020, due to the COVID-19 pandemic, the UN prediction was underestimated by around 275 million people (Development Initiatives, 2023).

The expected number of people in need of humanitarian assistance in 2024 is 299 million people, which would represent a decrease of 12% if compared to the demand expected for 2023 (OCHA, 2022). According to the Office for the Coordination of Humanitarian Affairs (OCHA), despite the mild decrease between 2023 and 2024, the humanitarian need will continue to increase in the next decade. This is mostly driven by the following six trends: climate crisis (I), widening inequality (II), pandemics and disease outbreaks (III), slow and uneven economic growth (IV), increasing instability, fragility, and conflict (V), fragmented and competitive geopolitical landscape (VI) (OCHA, 2023).

Aviation is the first point of call providing safe, reliable humanitarian access, through rapid delivery of aid, being especially crucial in situations where disaster regions are not accessible due to active conflict or damaged, insufficient or inexistent infrastructure (IATA, 2022). Aviation plays an essential role in the movement of humanitarian air cargo, which includes emergency food (ready-to-eat meals, therapeutic foods, staple foods, perishable foods), water, medical supplies (medicine, vaccines and hygiene materials), and shelter material (blankets, tents, toolkit, tarpaulins and kitchen sets) (UNHRD, 2024). Besides cargo, humanitarian air services include the transportation of relief teams and can also include the transportation of people out of the conflict zone.

The provision of international humanitarian assistance is described by the UN General Assembly resolution 46/182: "Strengthening of the coordination of humanitarian emergency assistance of the United Nations". One of the twelve guiding principles of humanitarian assistance is that it "must be provided in accordance with the principles of humanity, neutrality and impartiality". In 2003, independence was added by the UN General Assembly resolution 58/114 (OCHA, n.d.-a). Such principles are incorporated by the International Committee of the Red Cross (ICRC), to which voluntary service, unity and universality are added (ICRC, n.d.-d).

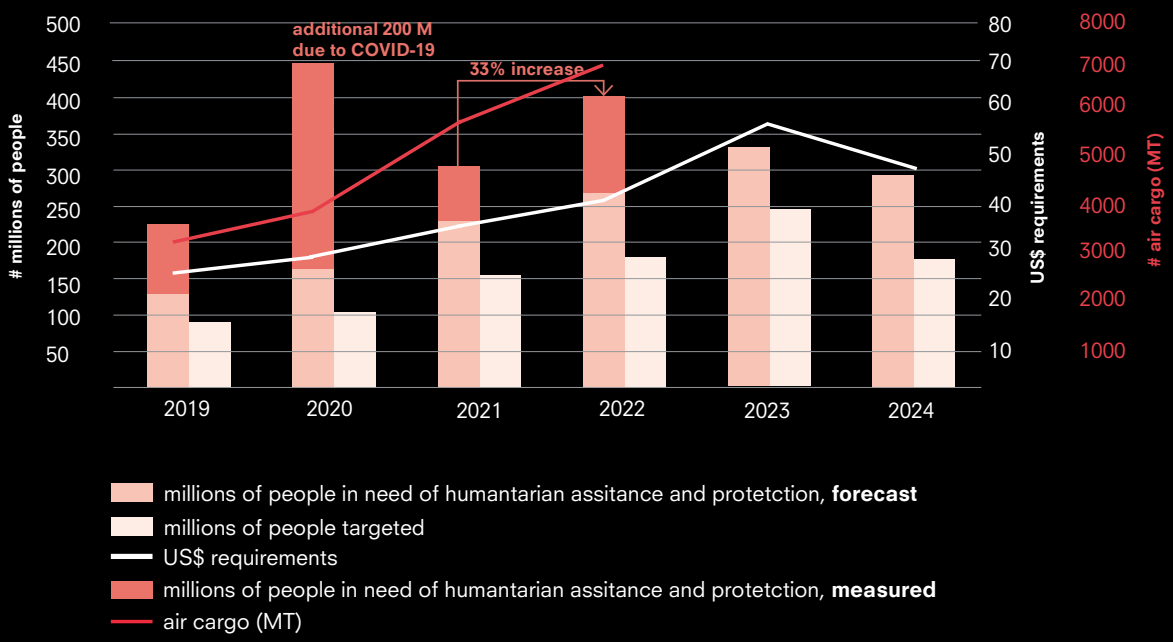
Humanity: Human suffering must be addressed wherever it is found. The purpose of humanitarian action is to protect life and health and ensure respect for human beings. (OCHA, n.d.-a)

Impartiality: Humanitarian action must be carried out on the basis of need alone, making no distinctions on the basis of nationality, race, gender, religious belief, class or political opinions. (OCHA, n.d.-a)

Neutrality: Humanitarian actors must not take sides in hostilities or engage in controversies of a political, racial, religious or ideological nature. (OCHA, n.d.-a)

Independence: Humanitarian action must be autonomous from the political, economic, military or other objectives that any actor may hold in relation to areas where humanitarian action is being implemented. (OCHA, n.d.-a)

The UN humanitarian actions are coordinated by the Office for the Coordination of Humanitarian Affairs (OCHA), established in 1991, in the context of the Gulf War (OCHA, n.d.-c). Besides coordination, OCHAS' main functions include advocacy and communications, humanitarian financing, policy, and information management (OCHA, n.d.-c; OCHA, 2023). The Humanitarian Cluster System for global emergency response coordination, established in 2005, aims to improve prioritization and reduce



CLIMATE CRISIS

WIDENING INEQUALITY

PANDEMICS AND DISEASE OUTBREAKS

SLOW AND UNEVEN ECONOMIC GROWTH

INCREASING INSTABILITY, FRAGILITY AND CONFLICT

FRAGMENTED AND COMPETITIVE GEOPOLITICAL LANDSCAPE

duplication, by effectively engaging multiple stakeholders (OCHA, n.d.-b). The organizations are divided into eleven core sectors, including food security, water, health, shelter, and logistics.

"Humanitarian logistics: the process of planning, implementing, and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from the point of origin to the point of consumption for the purpose of alleviating the suffering of vulnerable people. The function encompasses a range of activities, including preparedness, planning, procurement, transport, warehousing, tracking and tracing, and customs clearance" (Thomas and Kopczak, 2005).

The World Food Program (WFP) is the designated global leader for humanitarian logistics, which includes the management of the United Nations Humanitarian Air Service (UNHAS), the United Nations Humanitarian Response Depots (UNHRD), and the Logistics Cluster.

UNHAS was established by the WFP in the 1980s and it operated at first in Angola, Ethiopia, Somalia, and Sudan. Since 2004, the WFP has been mandated to coordinate all UN agencies', non-governmental organizations', and implementing partners' humanitarian air operations (Dorn, 2016). UNHAS is the main provider of aviation logistics in face of humanitarian relief operations. It "offers safe, reliable, cost-efficient and effective passenger and light cargo transport for the wider humanitarian community to and from areas of crisis and intervention" (WFP, 2024).

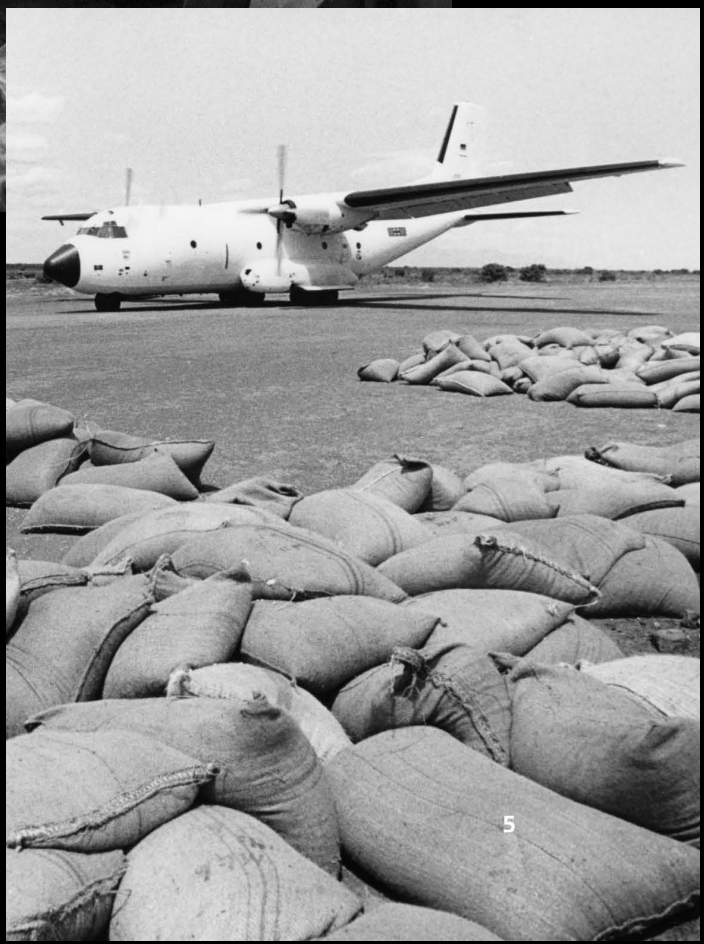
In 2022, UNHAS has served 22 operations, covering 540 destinations, and including 53.100 flights. A total of 7.019 metric tonnes of humanitarian cargo and 395.000 passengers were transported. With a fleet of 74 contracted aircrafts, including 52 fixed-wings and 22 helicopters, UNHAS has served 732 organizations, including the International Federation of Red Cross and Red Crescent Societies (IFRC) (WFP, 2021).

The UNHRD is a humanitarian platform managed by the WFP focussing on supply chain solutions services, strategic partnerships, and research and development services (UNHRD, 2024). Its supply chain solutions services include flexible procurement, free storage, rapid transport (within 24-48 of request), handling, and the deployment of a Rapid Response Team. This is enabled by a network of six permanent strategic depots located in Brindisi (2000), Dubai (2006), Panama City (2007), Accra (2007), Kuala Lumpur (2012), and Las Palmas (2014). In terms of the strategic partnerships offered, the UNHRD reduces the existing bottlenecks for humanitarian operations by coordinating the relief effort and consolidating the cargo of its partners to reduce costs. The research and development services are conducted by the UNHRD Lab and focus on innovative products for humanitarian response.

PROBLEM STATEMENT

As previously stated, airports have a vital importance in the immediate response during humanitarian relief operations. In crisis situations, in order to comport humanitarian relief operations, airports are required to absorb a certain surge capacity. Nevertheless, the existing guidelines for the design of spaces dedicated to Humanitarian Relief Operations' activities in airports are still incipient, with an apparent lack of involvement of the participation of professionals related to the architectural field.

Literature review on the topic has provided very limited insight, with the aerodrome grid map being presented as a main spatial awareness tool to dealing with emergencies. The grid provides a clear coordinate (e.g., 1A) to any point in the airport, facilitating communications in times of crisis at the airport itself (ACI,



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2014). Despite the existence of security and safety standards for the design of airports, there is a lack of research related to the direct spatial consequences of crisis preparedness and response.

"Space planning aims to find solutions to the logistical problems by considering users' priorities, layout constraints, organizational structure and security issues". (WFP, 2021)

One important tool for the effective response of crisis situations is the establishment of contingency planning, which can be formally defined as "A management process that analyzes disaster risks and establishes arrangements in advance to enable timely, effective and appropriate responses (...) Contingency plans need to be regularly updated and exercised." (UNDRR, n.d.)

Contingency plans, such as that of the IFRC, rarely include spatial implications for preparedness and response during crisis situations (IFRC, 2021). Instead, such plans usually focus on the operational and managerial aspects, without accounting for their spatial implications. The contingency plans are based on scenarios and aim primarily to organize and coordinate courses of actions of multiple stakeholders in order to increase preparedness. Furthermore, the existing protocols and standards offered usually refer to the place of disaster itself rather than the place from which help is being deployed- the airport.

According to the 2019 29th ACI World Annual General Assembly's Resolution on Airports and Emergency Humanitarian Response, airports are requested to include disaster relief in their Emergency Response plans (HADRA, 2022). Furthermore, it elaborates on a series of requirements related to additional "surge" capacity, including spatial requirements for both the airside and the landside of the airport.

Regarding the airside requirements, emphasis is given to the ability to handle different, and possibly larger types of

Annex 1

Contingency plan format

1. Introduction

2. Disaster scenarios

- Hazards and risks
- Vulnerabilities and capacities
- Role, mandate and capacities of the National Society
- Best, most likely and worst-case scenarios
- Risk assumptions

3. Operational plan

- Strategy (e.g., search and rescue, relief, recovery), purpose and objectives (including numbers targeted)
- Areas of intervention (technical and geographical)
- Emergency assessment
- Management structure
- Logistics (movement, procurement)
- IT and communications
- Media and information

4. Coordination

- Movement, including use of international tools (FACT, RDRT, ERU)
- External, including government, UN, donors, NGOs

5. Quality and accountability

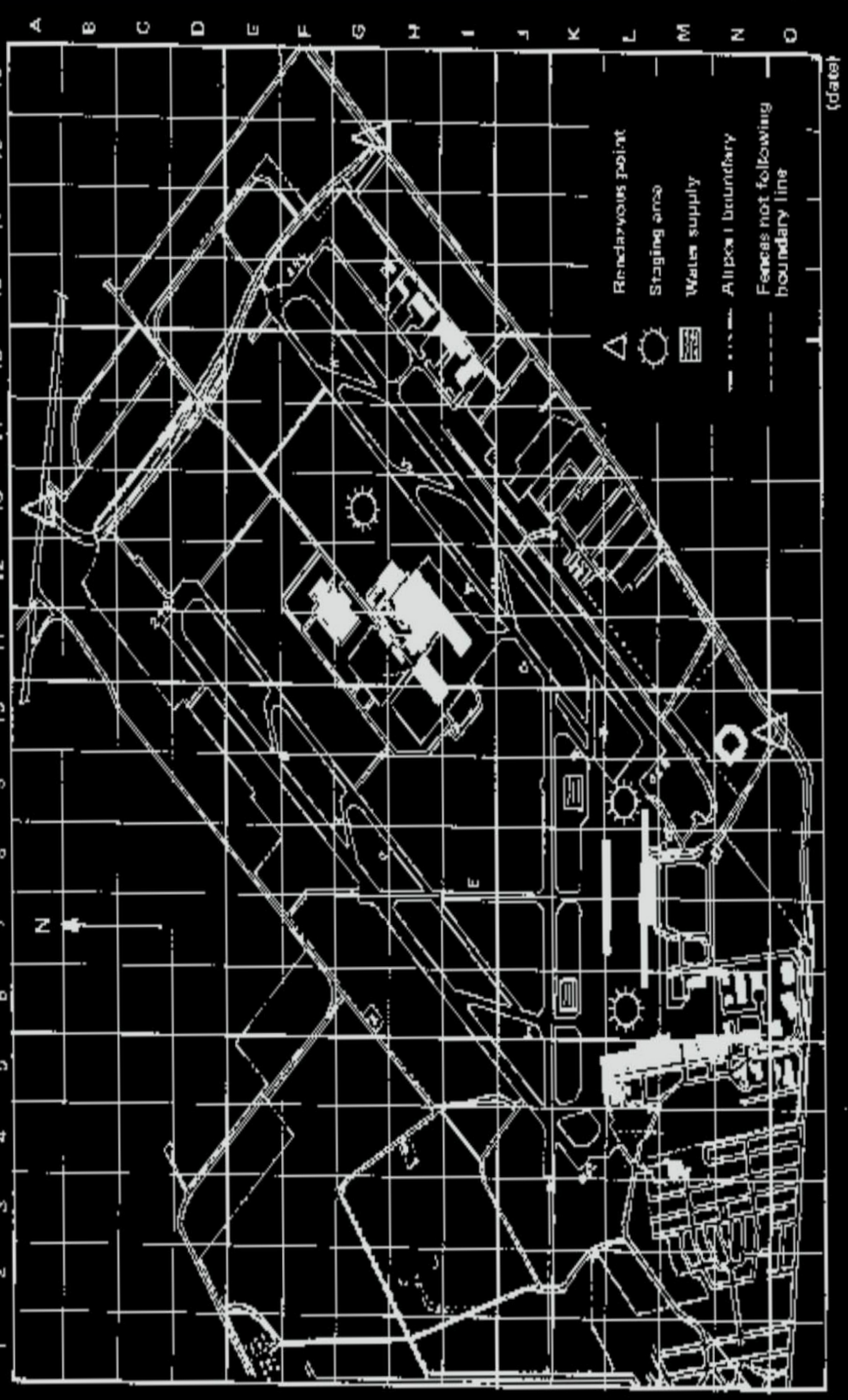
- Standards
- Principles

6. Implementing the plan

- Approval of the plan and distribution
- Identification of gaps and areas that require strengthening
- Stocks and logistics
- Human resources, training, simulation, volunteers
- Trigger mechanism
- Resource mobilization
- Review plan

7. Annexes

- Standard operating procedures
- Maps, hazard and risk analysis, VCA
- Scenario-building template
- Organization structure and authority in disasters, disaster-response diagram
- Lists of contacts
- Relevant reference documents (MoUs, etc.)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Rendezvous point
Staging area
Water supply
Airport boundary
Fences not following boundary line
(date)

airlines, including the required parking spaces. Not only must it be able to deal with a higher number of airplanes, including possibly different types of aircrafts, but also a higher flow of goods and people. The higher number of flights and aircraft requires that airports be designed taking into account this extra need of aircraft parking space, as well accounting for the existence of alternative grass landing areas with enough drainage and soil-bearing capacity. Moreover, support facilities such as temporary storage of fuels in drums, temporary lighting facilities, fencing, and airport maintenance, play a crucial role during crisis operations (HADRA, 2022; Polater, 2018; Choi and Hanaoka, 2017).

Concerning the lanside requirements, storage spaces for goods and personeel, including relief teams. (HADRA, 2022). In relation to the flow of goods, apart from the supplies already placed at the airport prior to the disaster event, airports must be able to deal with the increased flow of goods coming from additional suppliers and donors. Regarding the flow of people, airports must be able to accommodate the relief teams that will be deployed to the disaster affected areas. The day-to-day operations of such a team has as consequence specific spatial requirements, such as accommodation, bathroom facilities, and catering services (HADRA, 2022).

Furthermore, in order to provide timely response, the airport must operate as seamlessly as possible, adhering to certain standards of efficiency. For this reason, this research focuses on such standards, as illustrated by speed requirements for certain routes within the building (e.g., think of a fire-fighter and the seconds gained by sliding down the fire pole instead of taking the stairs).

During relief operations, the humanitarian activities within the airport happen either in permanent or temporary airport facilities, which function as medical treatment areas, logistics centers, and base camps and staging areas (Polater, 2018). The need for temporary facilities, such as tents, trailer units and grass landing areas, is often prompted by the space constraints with which humanitarian stakeholders have to deal with when conducting relief operations in airports (Choi and Hanaoka, 2017). While this indicates that the airport logistics base planning should not be rigid, it also points to the importance of the maintenance of unbuilt areas or the elasticity of buildings.

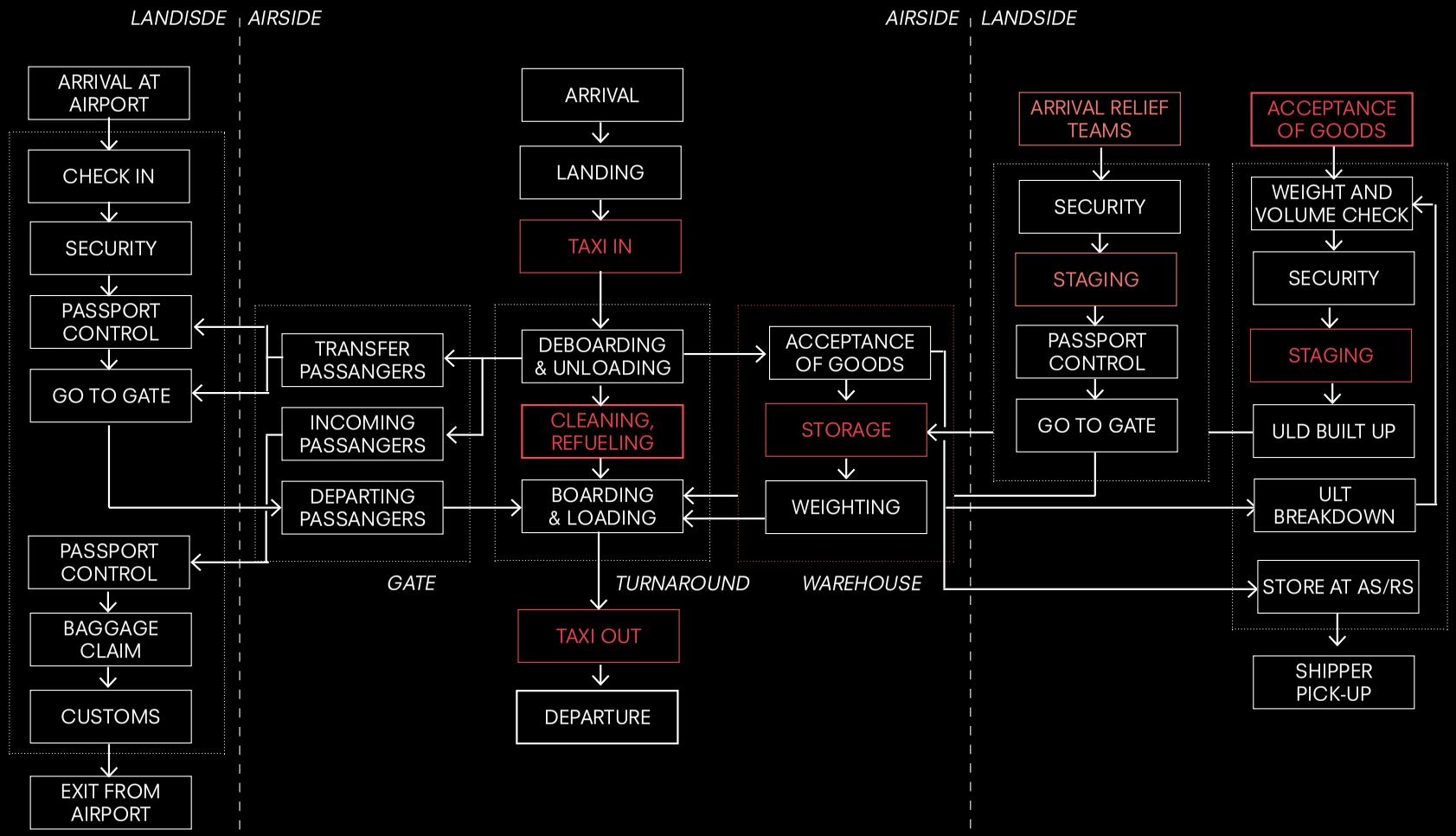
"Airports come in two sizes: too big and too small. Yet their size has no influence on their performance This suggests that the most intriguing aspect of all infrastructure is their essential elasticity. Calculated by the exact for the numbered - passenger per year - they are invaded by the countless and survive, stretched toward ultimate indeterminacy. (...) Infrastructure is no longer a more or less delayed response to a more or less urgent need but a strategic weapon, a prediction" (Koolhaas, 1995).

RESEARCH QUESTIONS

The aim of this research, conducted from an architectural perspective, is to explore space planning innovation that can enhance the efficiency of humanitarian relief operations. The research is guided by the following main question and subquestions:

To what extent can the understanding of crisis architecture inform the design of efficient airport bases for humanitarian relief operations?

I. THESIS TOPIC: How can crisis architecture be defined?
II. PROGRAM: What are the spatial requirements and constraints of humanitarian relief operations within airports?
III. SITE: What is the potential of repurposed urban infrastructure to host humanitarian relief operations?
IV. CLIENT: How can the stages of preparedness and response of the crisis management be translated spatially?



ULT = Unit load device
AS/RS = Automated storage and retrieval systems

RELIEF TEAMS
CARGO

RESEARCH FRAMEWORK

02

THEORETICAL FRAMEWORK

The proposed research framework involves the theory related to humanitarian relief operations, humanitarian spaces, crisis management, humanitarian supply chain management, crisis architecture, and functional design.

Humanitarian relief operation

Literature review related to the topic of Humanitarian relief operation (HRO) includes multiple terms and definitions: disaster relief, disaster relief operation (DRO), emergency relief, humanitarian action, humanitarian assistance, humanitarian intervention, humanitarian operations, emergency response. Despite the varying definitions, the definitions have as common ground the urgency in assisting the sticken population, the imperative of saving lives, and the guiding humanitarian principles (Wagemans, 2017). The demand for humanitarian relief operations is caused by the onset of emergencies and disasters.

"[Disaster is] a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts". (UNDRR, n.d.)

"Emergency is sometimes used interchangeably with the term disaster, as, for example, in the context of biological and technological hazards or health emergencies, which, however, can also relate to hazardous events that do not result in the serious disruption of the functioning of a community or society". (UNDRR, n.d.)

"A complex emergency is a humanitarian crisis in a country, region or society where there is total or considerable breakdown of authority resulting from internal or external conflict and which requires an international response that goes beyond the mandate or capacity of any single and/or ongoing UN country programme". (OCHA, 2015)

Crisis management

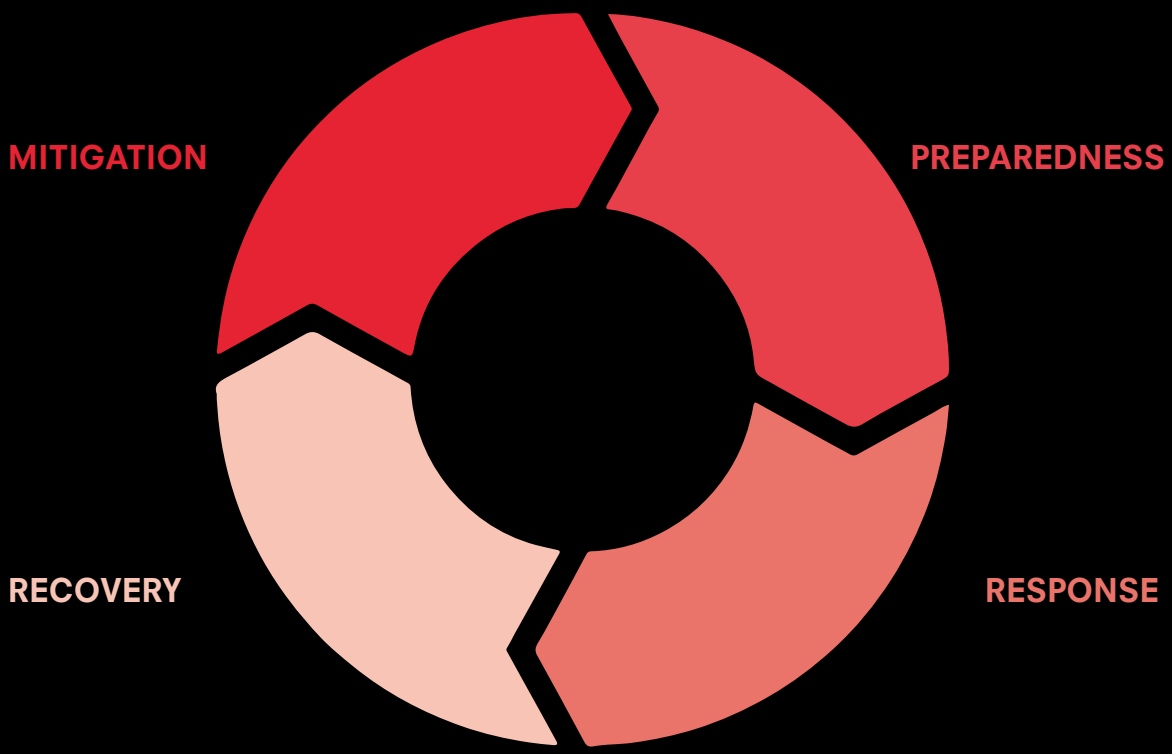
By incorporating the knowledge of crisis management, as illustrated by the crisis management cycle, it is expected to gain insight on spatial efficiency. More specifically, this research focuses on how the activities related to the preparedness and response can be taken into account to increase spatial layout efficiency in the architectural design of humanitarian spaces for disaster relief operations in airports. The cycle includes the four steps: mitigation, preparedness, response, and recovery (Carter, 1992; Tomasini and Wassenhove, 2009; Goldschmidt and Kumar, 2016). These four steps are divided into two phases: before the disaster, associated with development, and after the disaster, related to relief. Below, the definition of each phase is presented as according to the United Nations Office for Disaster Risk Reduction (UNDRR, n.d.).

"[Mitigation is based on] the lessening or minimizing of the adverse impacts of a hazardous event". (UNDRR, n.d.).

"Preparedness is based on a sound analysis of disaster risks and good linkages with early warning systems, and includes such activities as contingency planning, the stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises". (UNDRR, n.d.).

"[Response is based on] Actions taken directly before, during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected". (UNDRR, n.d.).

"[Recovery is based on] the restoring or improving of livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and "build back better", to


MITIGATION
PREPAREDNESS
RECOVERY
RESPONSE
Development: before the disaster
Relief: after the disaster

avoid or reduce future disaster risk". (UNDRR, n.d.).

The role of architecture in each of these phases is multi-faceted and ranges from a more political to a more practical role. In an attempt to map the role of design in emergencies - which is here referred to as architecture in crisis scenarios - Rawsthorn & Antonelli (2022) have mapped out the role of design from the sounding of the alarm, to response, until the crisis aftermath. In their framework, they emphasize the phases of response and recovery, once disaster has stricken.

Firstly, when it comes to the onset of the disaster, "one of design's crucial functions in an emergency is to inform as many people as possible about danger or atrocities" (Rawsthorn & Antonelli, 2022, p. 21). This is illustrated, for instance, by the work of Hawksworth in depicting the interior of the French slave ship Vigilante in 1823. Another example is the work of John Snow in mapping the cholera epidemic in Soho in 1854, which enabled the to trace the cause of the disease to the lack of water quality. (Rawsthorn & Antonelli, 2022)

Secondly, in the response phase, design's role is "to help protect us from them by enabling us to avoid them or, if that fails, by mitigating their impact" (Rawsthorn & Antonelli, 2022, p. 24). This is exemplified by the role of design during both war and times of epi- and pandemics. Related to crisis architecture in war times, the military hospitals prefabricated by Isambard Kingdom Brunel during the Crimean War in the 1850s constitute an early example. Regarding the crisis architecture related to the outbreak of diseases, the protocols (e.g. quarantine and social distancing) established during not only during the COVID-19 pandemic in 2020 but also as early as 1346 in the case of the Black Death epidemic, have led to clear spatial requirements. (Rawsthorn & Antonelli, 2022)

Lastly, in the aftermath, "once the immediate danger of an emergency has passed, design's responsibility is to find ways of repairing the damage it has caused and of preventing repetitions" (Rawsthorn & Antonelli, 2022, p. 29). This is exemplified by the development of city parks and sewer systems as urban design tools as ways to minimize public health crisis and increase quality of life.

Supply chain management

Supply chain management involves activities related to logistics, sourcing and procurement, and coordination of stakeholders, such as suppliers, intermediaries, third party service providers, and customers (CSCMP, n.d.).

The supply chain flows within a commercial sector are often referred to as the three Bs: Boxes (material), Bytes (information), and Bucks (financial resources). In addition to these, the humanitarian supply chain also includes Bodies (manpower deployed) and Brains (knowledge and skills). The latter is specially important since it is related to the intrinsic need of adaptability of the humanitarian supply chain to crisis situations, leading to a frequent reinvention of the wheel (Tomasini and Wassenhove, 2009). When compared to the commercial supply chain, the humanitarian supply chain is characterized by its ambiguous objectives; limited human, capital, and infrastructural resources; high uncertainty and urgency; and politicized environment.

Firstly, the ambiguity is related to the often lack of coordination of the humanitarian responses and the disparate and spontaneous character. Secondly, in terms of human resources there is often a challenge related to a lack of qualified and readily deployable personnel, lack of funds, and damaged, insufficient or inexistent infrastructure. Thirdly, there is an intrinsic uncertainty - related to dynamic changes of supply and demand - and urgency related to humanitarian relief operations, which requires a high level of intensity - measured by the number of tasks divided by the product of the time and available resources. Lastly, despite the so-called impartial stance of the humanitarian operations, it is often difficult to safeguard the humanitarian space (Tomasini and Wassenhove, 2009).

PREPAREDNESS

- Prevention
- Early warning
- Contingency planning
- Emergency response systems
- Intergovernamental support
- Provision of stand-by resources
- Pre-positioning of supplies
- Training, research and innovation

RESPONSE

- Assessment of problem, needs and resources
- Handling donor relations and media interest
- Resource mobilization
- Operations planning
- Implementation and coordination
- Monitoring and evaluation
- Transition to the post- emergency operation

Functional design theory

Functional design theory is leveraged to gain insight on spatial layout efficiency. Research is conducted on the architectural movement of functionalism as a departing theoretical point, considering its primary concern related to the activities housed by a building and the technological mechanisms associated with its structure and operation (Lang and Moleski, 2016). In a broader sense, beyond the characteristics of the movement itself, the functional design will also be researched in relation to the practicality of use, related to the strictly practical and measurable studies of functions, such as movement patterns.

Crisis Architecture

The existing literature on "crisis architecture" is rather scarce. The term as presented is rarely used, except on a few occasions (Driessen, 1995).

"(...) Crisis architecture is nothing more than an attempt to identify and define immediate architectural responses to short term differing socio-cultural conditions. (...)" (Driessen, 1995).

From a more symbolic point of view, crisis architecture can be conveyed through a symbolic architectural expression. This is the case, for instance, of the Red Cross Pavilion designed by ELBA for the 1992 Expo in Seville, Spain. The irregular features of the building serve as a metaphor of the damage caused by both war and disaster. The apparent instability of the structure is reminiscent of a building in the state of imminent collapse in the aftermath of an earthquake (Reid & Gilbo, 1997).

In order to understand the conceptualization of "crisis architecture", this research proposes a definition that goes beyond a single characterization and attempts to adopt a more nuanced view on the topic. Aiming to derive the supposedly paradoxic underlying spectrums related to the concept of crisis architecture, a framework is proposed to analyse it in terms of perspective, expression, temporality, adaptability, and tools.

CRISIS ARCHITECTURE:
ON PERSPECTIVE
from demand to supply
ON EXPRESSION
from humanitarian spaces to military bases
ON TEMPORALITY
from transitional to permanent
ON ADAPTABILITY
from change of plan to change of function
ON MATERIALITY
from residual to resilient
ON TOOLS
from contingency to scenario planning

RELEVANCE

The design of a crisis hub is hereby proposed as a medium to explore the meaning of crisis architecture and the ways in which the airport humanitarian spaces' layout can contribute to the optimization of humanitarian relief operations.

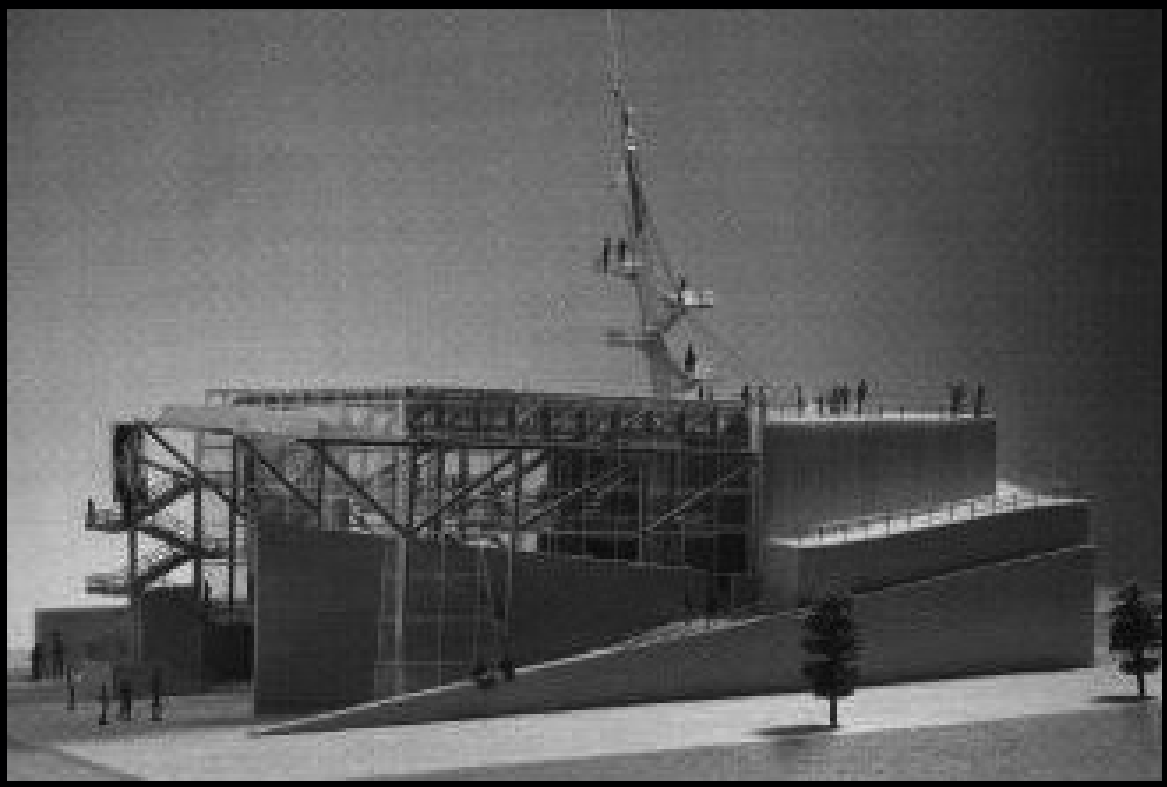
Architectural implications

This research aims to contribute to the architecture field by providing insights into how functional spatial layout can increase operational efficiency. Therefore, the goal is to reinforce the role of architects beyond the aesthetic concerns of the built environment.

The construction of humanitarian spaces in airports - such as warehouses, base areas, and staging areas - follows specific standards and are typically replicated, such as in the case of the UNHRD, with very few regards to local conditions. This research sets out to explore what specific solutions can be found to repurpose local infrastructure for humanitarian relief operations, based on the case study of the Tegel Airport in Berlin.

Industry impact

This research aims to integrate the architectural knowledge to the field to possibly provide new insights into spatial efficiency solutions for humanitarian relief



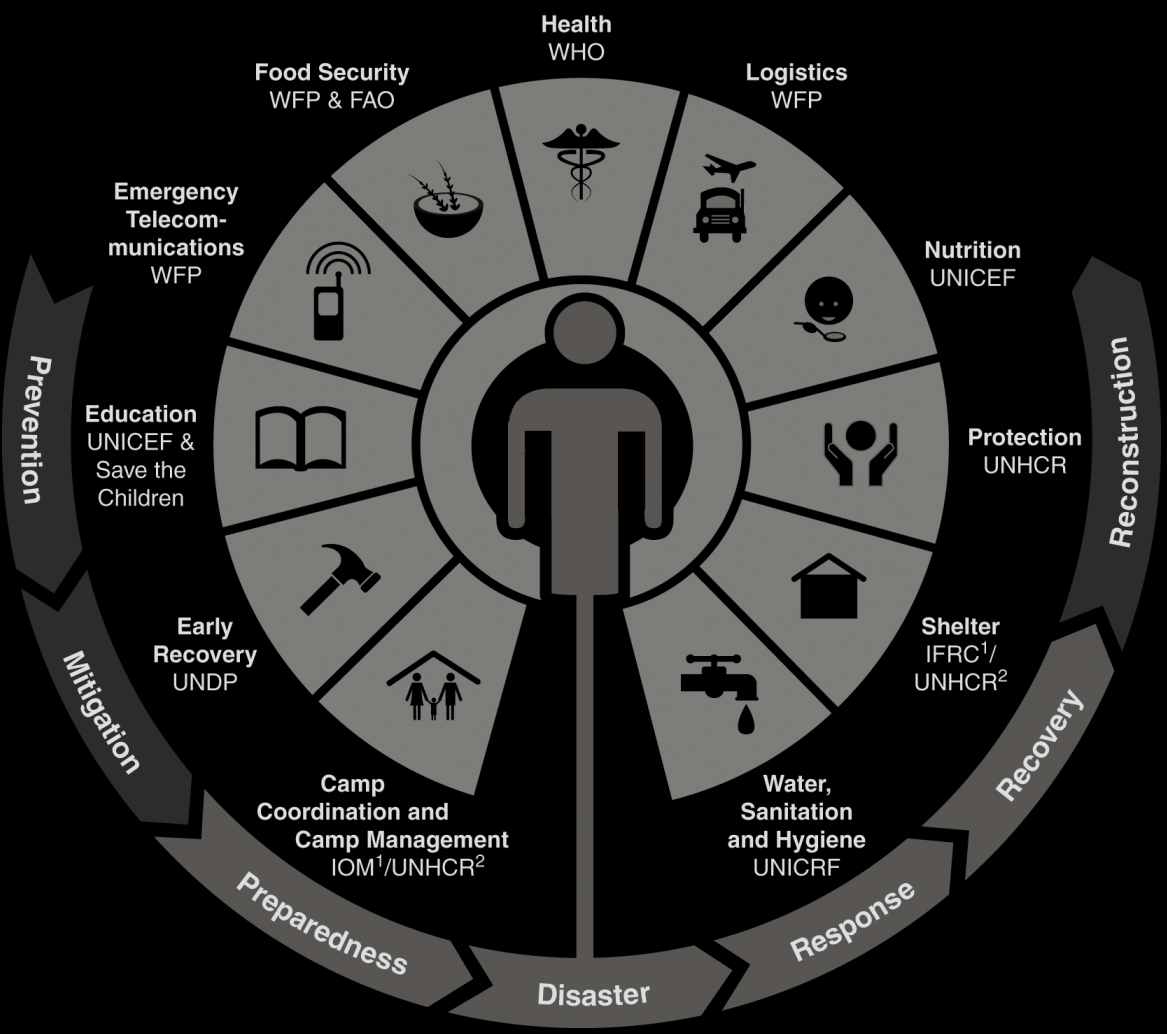
ELBA, 1992
Red Cross Pavillion, ?m2
Built - '92 Expo Seville, Spain

operations. The effective collaboration among professions of the field of supply chain, logistics, operations, aerospace, engineering, and architecture is crucial when dealing with such a complex challenge. Therefore, the proposed multidisciplinary perspective could have cross-industry benefits.

For example, an optimal spatial layout of a warehouse could possibly increase efficiency standards upheld during humanitarian relief operations. In addition, optimal routing, including shortcuts, for relief teams in base camps can enhance efficiency. In the same way that the fire pole and the elevator were inventions that led to a paradigm change in the relation of people to the built environment, this research aims to provide innovative solutions for increasing operational efficiency.

Policy and regulation

The humanitarian relief operations are highly politicized, involving multiple stakeholders with often diverging interests. The solutions of the spatial constraints at airports' operations alone will doubtfully compensate for the inefficiencies deriving from political and bureaucratic issues intrinsically associated with such operations. Nevertheless, the research aims to contribute to insights on how the architectural expression and spatial qualities of the humanitarian spaces at airports could reflect the humanitarian principles. The spatial translation of such principles could possibly, in turn, aid their reinforcement.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Logistics
WFP
Nutrition
UNICEF
Protection
UNHCR
Shelter
IFRC[1]/
UNHCR[2]
Water,
Sanitation
and Hygiene
UNICRF
Camp
Coordination and
Camp Management
IOM[1]/UNHCR[2]
Early
Recovery
UNDP
Education
UNICEF &
Save the
Children
Emergency
Telecom-
munications
WFP
Food Security
WFP & FAO
Prevention
Mitigation
Preparedness
Disaster
Response
Recovery
Reconstruction

RESEARCH METHODS

03

PROGRAMME

The main research methods used to come up with a programme are benchmarking and case studies. Furthermore, based on the established framework for understanding crisis architecture, insights related to standardization, modularity, scalability, speed, control, and efficiency are drawn from the analysis of different building typologies, including fire station, warehouse, and roman military camps.

The case studies selected include the five of the six permanent Humanitarian Response Depots of the United Nations (UNHRD): Brindisi (2000), Dubai (2006), Panama City (2007), Accra (2007), Kuala Lumpur (2012) (UNHRD, 2024). The UNHRD of Las Palmas (2014) was left out of the scope since no data was found. Furthermore, an analysis was done related to one facility of the International Committee of the Red Cross (ICRC) - the ICRC Logistics Complex in Geneva (group8, 2011) - and one facility of the International Federation of Red Cross and Red Crescent Societies (IFRC) in Réunion Island - the PIROI Center (French Red Cross, n.d.).

It is noteworthy to highlight the fact that in 2019, the UNHRD of Panama was relocated to the Regional Logistics Center for Humanitarian Assistance (CLARH). This facility, also located at the Panama Pacifico Airport (BLB) functions as a new regional humanitarian logistics hub and includes not only a UNHRD facility but also a IFRC warehouse. In that sense, the case study of Panama represents an intersection of the institutions analyzed.

In terms of the program, the key spaces of the facilities analyzed include, besides a warehouse, also training, administrative, and - exceptionally in the case of Brindisi - also accommodation. The research of the spatial requirements for the crisis hub are underpinned by the understanding of the stages of preparedness and response phase of the crisis management cycle and their relation to these key spaces identified.

In addition, the research methods for the program include the development of a relation scheme and massing studies, aimed at providing further insights on the underlying relations among the different key spaces of the program. These methods are leveraged to bridge the research and the design phase.

SITE

The location research conducted for the purpose of this research is segmented in the global, urban, and airport scale of analysis. Throughout all these scales, the criteria of effectiveness, efficiency, and equitable humanitarian aid, also known as the 3E framework, is taken into account. Effectiveness and efficiency differ for being respectively related to the speed and operational costs of humanitarian aid delivery. (Nawazish et al., 2022). Considering the global scale, the criteria of proximity to beneficiaries, likelihood of disaster, and national stability are taken into consideration. Nevertheless, no deep research is done in relation to this criteria since, for the purpose of this design project, Berlin is already given as a city. Therefore, the focus lies on the urban and airport scale analysis.

Urban scale

The starting point for the site analysis are the location criteria defined by the “Future” Group, which graduated from Complex Projects in 2023. The location research conducted by the group has informed their site analysis through the establishment of three criterias to be followed by all group members, who were each responsible for designing a different complex building in 2022. The research included a critical analysis of the criteria established by the Future Group, rather than an inconsequential adherence to their criteria.

Furthermore, alongside the Future Group’s

PANAMA
BLB

ACCRA
KIA

BRINDISI
BDS

DUBAI
DWC

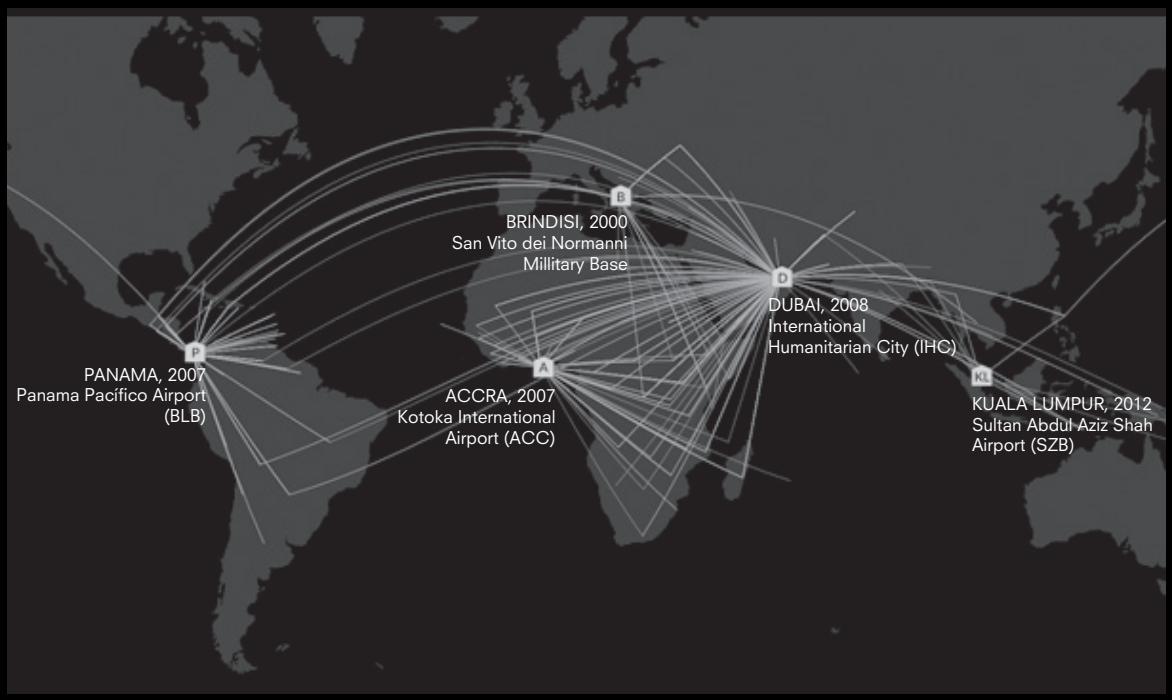
KUALA LUMPUR
SZB

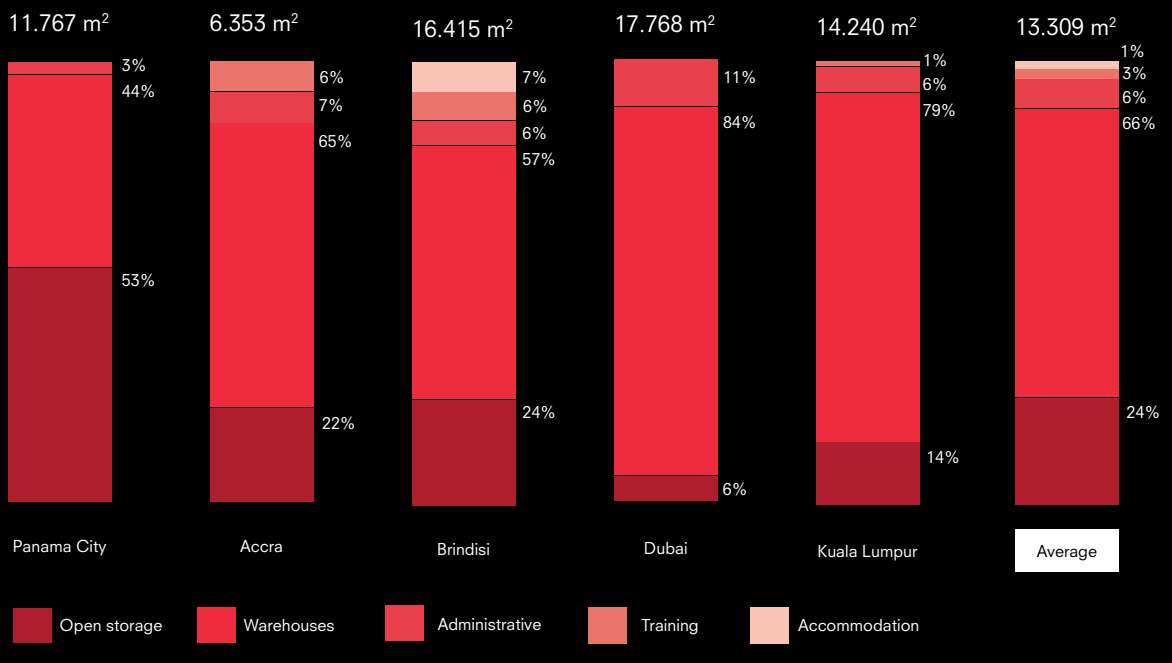
UNHRD
Humanitarian
Response Depot

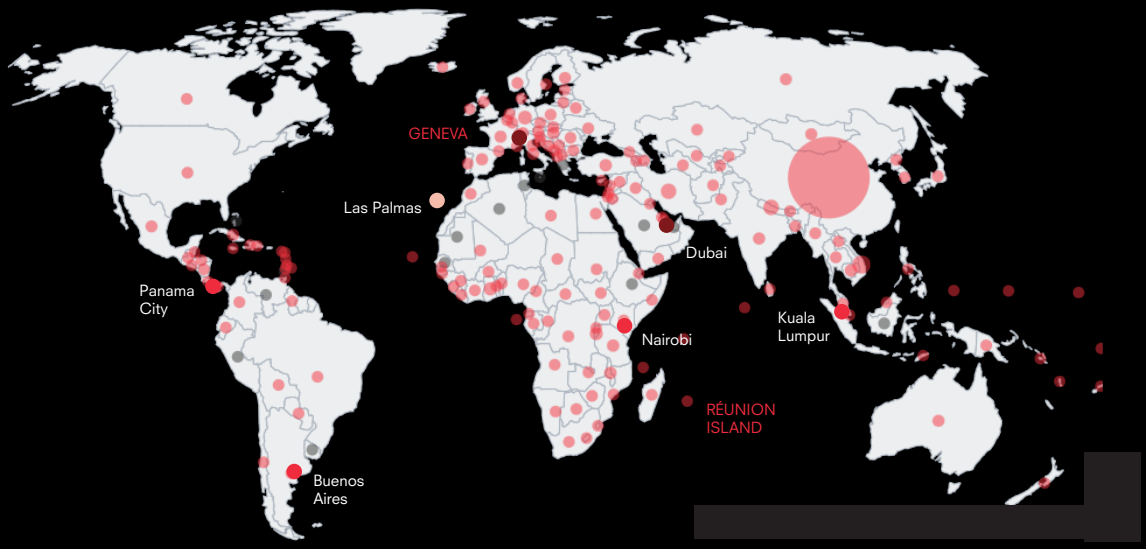
RÉUNION
ZAA

GENEVA
GVA

ICRC IFRC

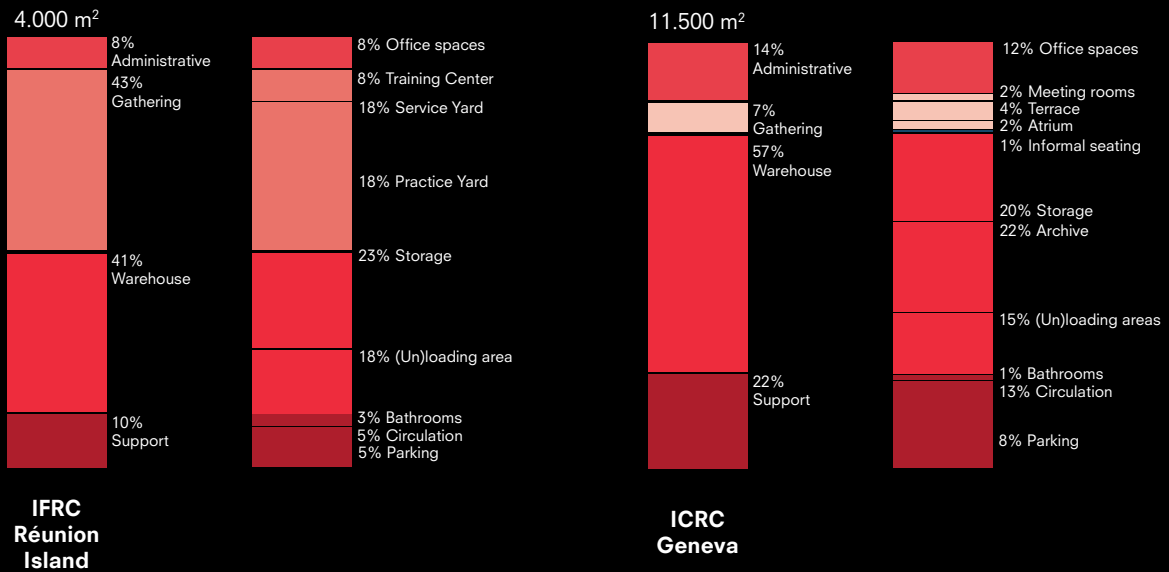

BRINDISI, 2000
San Vito dei Normanni
Millitary Base
DUBAI, 2008
International
Humanitarian City (IHC)
PANAMA, 2007
Panama Pacífico Airport
(BLB)
ACCRA, 2007
Kotoka International
Airport (ACC)
KUALA LUMPUR, 2012
Sultan Abdul Aziz Shah
Airport (SZB)

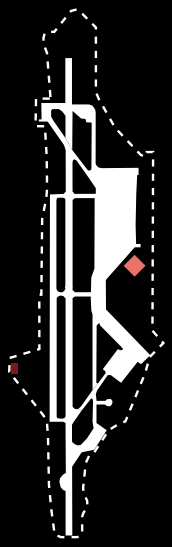

11.767 m2
3%
44%
53%
6.353 m2
6%
7%
65%
22%
16.415 m2
7%
6%
6%
57%
24%
17.768 m2
11%
84%
6%
14.240 m2
1%
6%
79%
14%
13.309 m2
1%
3%
6%
66%
24%
Panama City
Accra
Brindisi
Dubai
Kuala Lumpur
Average
Open storage
Warehouses
Administrative
Training
Accommodation



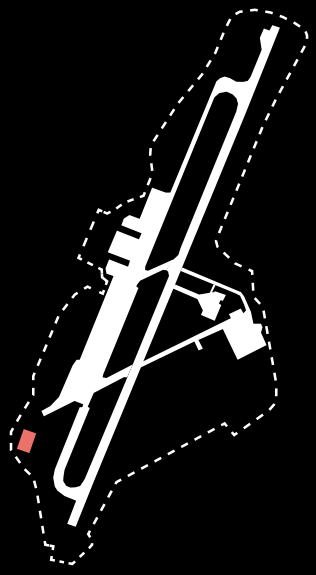
CASE STUDY

- Reference centers — *research and innovation*
- Global Logistics Service — *global coordination, management, support, and training*
- Zonal Logistics Unit (ZLU) — *localized logistical support to National Societies*
- Logistics Hub — *main storage points for pre-positioned stock*



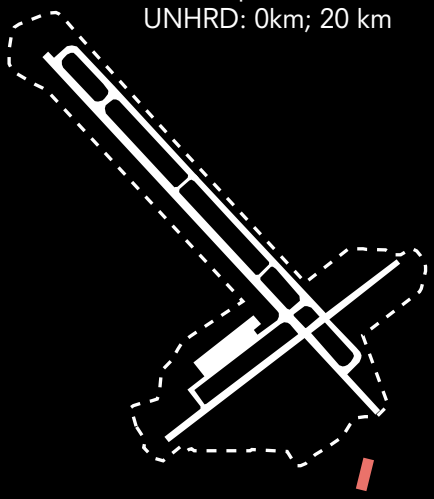


PANAMA
BLB Airport
UNHRD: 4 km

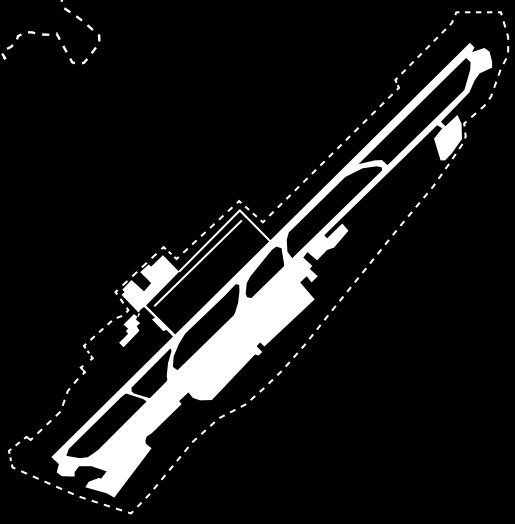


ACCRA
KIA Airport
UNHRD: 0 km

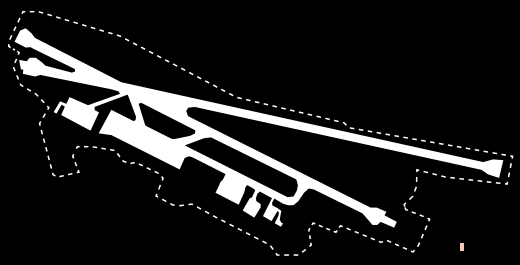
BRINDISI
BDS Airport
UNHRD: 0km; 20 km



KUALA LUMPUR
SZB Airport
UNHRD: 12 km



GENEVA
GVA Airport
ICRC Logistics Complex: 5 km



RÉUNION ISLAND
ZAA Airport
IFRC PIROI: 4 km

IFRC/ICRC facilities

UNHRD facility

UNHRD & IFRC joint facility

1:50.000

** depots located at 20km from airpots are not shown (Dubai and Brindisi)*

criteria, the research involved coming up with a unique set of requirements for a site. A research was conducted on the story of the airports of Berlin in the last century and, in sight of the abundance of existing airfields, the choice was made to repurposing existing infrastructure. As a consequence, the logic of the location research was inverted and instead of focussing on where the airports should be located, the criteria were established based on optimal humanitarian warehouse location. For this purpose, literature review was conducted in an attempt to consolidate the criteria for optimal warehouse location in the context of humanitarian relief operations (Roh et.al., 2013; Nawazish et. al., 2022; Eligüzel et. al. 2023; Richardson et. al., 2016).

Airport scale

Specifically in relation to the paradoxical association with the military when it comes to the provision of humanitarian relief, literature review has been conducted. This has also been supported by a case study of the urban context of the UNHRD facilities and their comparative level of militarization and operation efficiency. This analysis of the case studies has served as inspiration for determining the option space for location of the crisis hub at the airport scale.

In addition, for the month of September, a field trip is being organized to Berlin. Considering that the site of Tegel has restricted access and that the site is set to be redeveloped into an Urban Tech Republic, telephone calls and emails have been exchanged in order to organize a guided visit to the airport. The site visit would provide an unique opportunity to experience the space and document the existing infrastructure.

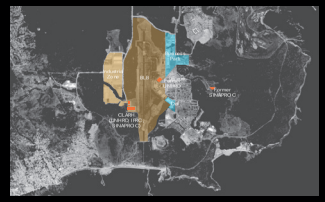
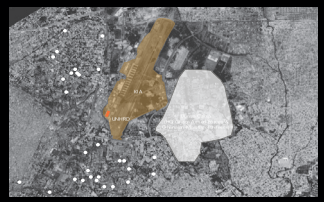
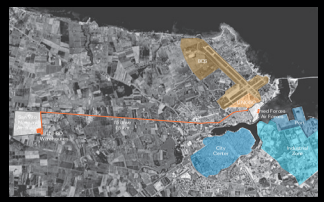
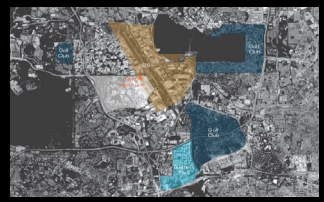
CLIENT

In order to decide upon the adequate client, literature review, institutional report, and general news were used as primary sources. Besides the actions performed by the client within the humanitarian sector, the choice for a client has taken into consideration the presence of the client in Germany, and more specifically in Berlin.

The chosen client is the German Red Cross as part of the International Federation of Red Cross and Red Crescent Societies. Therefore, an in depth literature review was conducted on the history of the Red Cross and Red Crescent Movement, including also the International Committee of the Red Cross (ICRC). A research was conducted on the client's ambitions based on its institutional reports and, based on this, the client's goal for the architectural project hereby proposed were established.

URBAN SCALE - LOGISTICS - UNHRD MILITARIZATION LEVEL

Military presence does not seem to be related to efficiency

	DUBAI, 2006	PANAMA, 2007	ACCRA, 2007	BRINDISI, 2000	KUALA LUMPUR, 2012
					
	AT FREE ZONE	AT LOGISTICS CENTER OF FORMER MILITARY AIRPORT	AT LOGISTICS CENTER NEXT TO ACTIVE MILITARY BASE	PARTLY AT ACTIVE AND PARTLY AT DEACTIVE MILITARY BASES	AT ACTIVE AIRPORT MILITARY BASE
MT HUM. CARGO / M2 UNHRD FACILITIES	0,27	0,10	0,06	0,01	0,15
UNHRD FACILITIES / TOTAL AIRPORT AREA	0,01%	0,13%	0,13%	0,52%	0,10%
EFFICIENCY RANKING	#1	#3	#4	#5	#2

DESIGN BRIEF

04

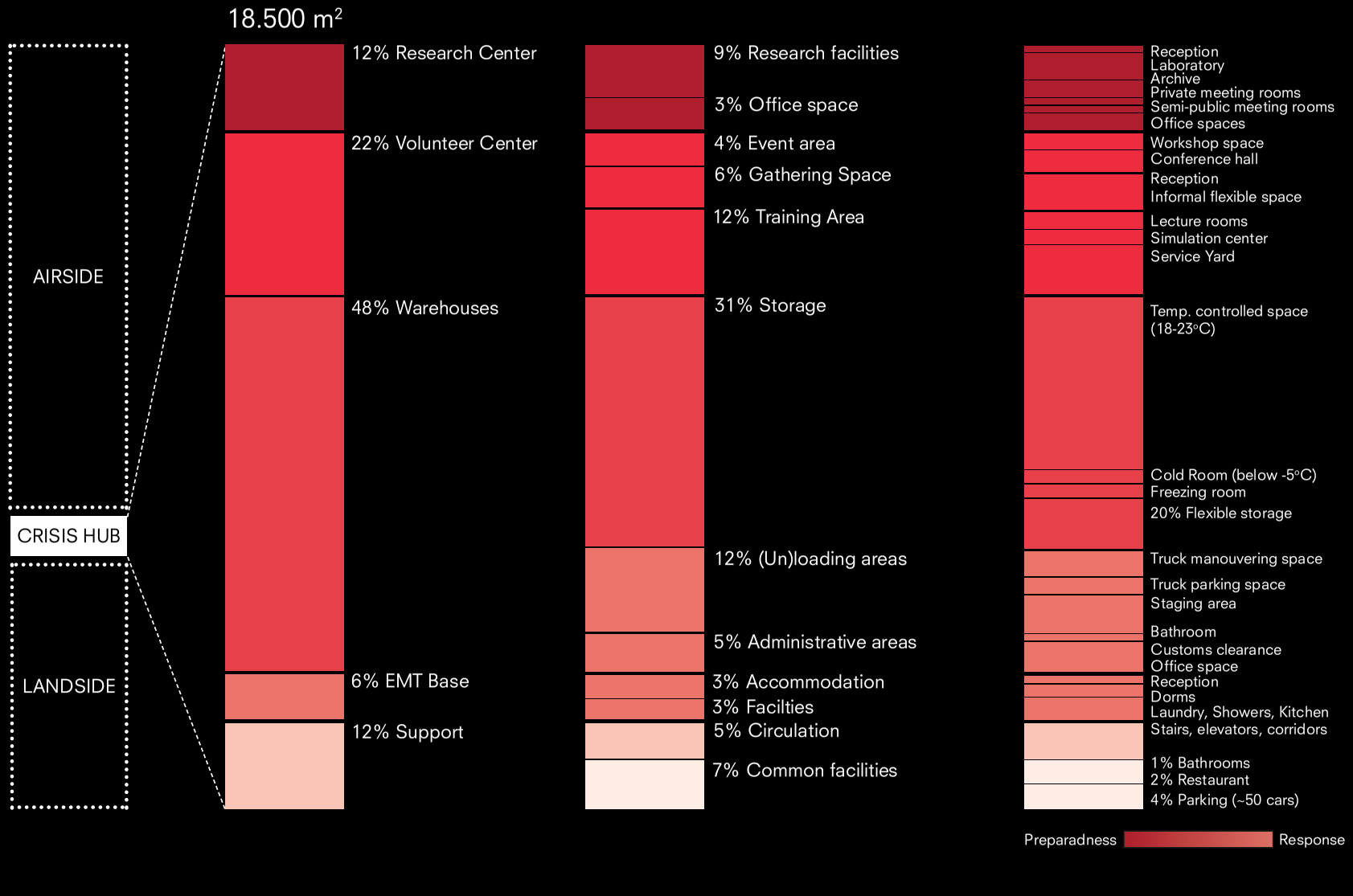
PROGRAM

The initial proposal for the programme requirements is based on the benchmark based on the UNHRD, ICRC and IFRC facilities. The proposed program includes a research center, a volunteer center, a warehouse, and an Emergency Medical Team (EMT) base. Each of these spaces plays a different role in the spectrum of preparedness and response. While the research center and the volunteer center are more related to preparedness, the EMT base is intrinsically related to the response. The warehouse plays a key role in bridging preparedness and response. This is because the warehouse must not only be pre-positioned with supplies before a crisis but also function efficiently once an emergency strikes and supplies need to be retrieved and staged for shipment.

By relating the key spaces of the program to the crisis management cycle, an attempt was made to directly reflect the spatial implications of crisis operations. In the relation scheme, the security barrier between land and airside is established and the consequences for accessibility for the different stakeholder groups are explored. The stakeholders analyzed include researchers, volunteers, emergency medical teams, and relief cargo staff. The volunteer center is the only key space that is accessible to all stakeholders and therefore could potentially be designed as a central space in the layout.

Considering the framework of crisis architecture, several insights were drawn for the architectural implications of the project. These insights are summarized in the table below and are further explored in the massing studies for the program. In the following sections, marked by the red pages of the report, the research conducted in relation to crisis architecture is explained in more depth. In conclusion, the research has led to the definition of design principles that will guide the design phase of this project: standardization, modularity, scalability, speed, control, and

	Elements of efficiency	
Typo ogy	**Vertical**	**Horizontal**
Cyclone Shelters (IFRC)	- Exterior staircase	- Elevated first floor, free ground floor plan
Warehouses	- Pallets - Mezzanine for administrative functions	- Program layout: L-, U- or I shaped - based of process of receiving, picking, storage, sorting, and shipping supplies - Aisles layout: traditional, flying-V, fishbone, chevron
Refugee camps	- n/a	- Standardization of the types and amount of facilities required for camp up scaling
Roman military camps	- n/a	- Spatial logic of *praetentura, latera praetori,* and *retentura* - based on increasing distance from the enemy
Fire station	- Fire pole	- Spatial logic of apparatus bay, administrative area, and dorm area - with increasing distance from deployment
Prison	- Maximization of clear sight lines for optimization of control: control tower, atriums	- Maximization of clear sight lines for optimization of control: circular, radial, cross plan, courtyard, and telephone pole floor plan layouts
Grain towers	- Hollow rounded reinforced concrete cells for grain store	- n/a
Bunkers	- Redundancy in paths for safety purposes - More depth for safety	- n/a


18.500 m²
AIRSIDE
CRISIS HUB
LANDSIDE
12% Research Center
22% Volunteer Center
48% Warehouses
6% EMT Base
12% Support
9% Research facilities
3% Office space
4% Event area
6% Gathering Space
12% Training Area
31% Storage
12% (Un)loading areas
5% Administrative areas
3% Accommodation
3% Facilties
5% Circulation
7% Common facilities
Reception
Laboratory
Archive
Private meeting rooms
Semi-public meeting rooms
Office spaces
Workshop space
Conference hall
Reception
Informal flexible space
Lecture rooms
Simulation center
Service Yard
Temp. controlled space (18-23°C)
Cold Room (below -5°C)
Freezing room
20% Flexible storage
Truck manouvering space
Truck parking space
Staging area
Bathroom
Customs clearance
Office space
Reception
Dorms
Laundry, Showers, Kitchen
Stairs, elevators, corridors
1% Bathrooms
2% Restaurant
4% Parking (~50 cars)
Preparadness
Response

efficiency.

ON PERSPECTIVE: STANDARDIZATION
from demand to supply
ON EXPRESSION - MODULARITY
from humanitarian spaces to military bases
ON TEMPORALITY - SCALABILITY
from transitional to permanent
ON ADAPTABILITY - SPEED
from change of plan to change of function
ON TOOLS - CONTROL
from contingency to scenario planning
ON MATERIALITY -EFFICIENCY
from residual to resilient

SITE

Urban scale

The starting point of the site analysis was three criteria for location choice established by the Future Group in 2022 based on their research of Berlin. The requirements were that the building must be located in one of the ten developed areas of the Urban Development Concept Berlin 2030 (1); and in an area that has a low density: built-up density area between 0.1 and 0.4 and a population density of 250p-ha (2); and in a post 1990s built neighborhood (3). In conclusion, the overlap of these criteria led to the conclusion that the chosen location should be located outside the central neighborhood of Berlin, the Mitte.

Considering the urban scale, the starting premise was that there was enough reuse opportunity to be explored within the city's seven existing airfields which have been developed throughout the last century. In order to pre-select some airports for a more detailed urban analysis, the minimum required runway length for humanitarian relief operations was determined based on the case studies. The altitude of a city has a direct impact on the required runway length: the lower the city altitude, the more dense is the air and thus less length is required to land or take off. For simplicity purposes, it was assumed that the average city altitude is 0 m (sea level), since most airports analyzed are also located to ports for strategic purposes. Considering the altitude of Berlin is of around 35 m, and thus negligible, the analysis of the case studies has revealed a minimum necessary runway length of 1870 m. As a result, Tempelhof (TPH), Tegel (TXL), and Berlin Brandenburg (BER) airports were pre-selected for analysis.

Assuming the repurposing of an airport is given, the question shifts from finding the optimal location for an airport to finding the optimal location for a warehouse for humanitarian relief operations. By inverting the logic and focussing on where the warehouses should be located, the emphasis is put on the operation efficiency of the humanitarian relief operations.

Considering the case studies selected, an analysis was done related to the distance between the warehouses and the airports. The minimum distance was of 0 km (UNHRD Accra) and the maximum of 20 km (Dubai and Brindisi), with a median distance of 5 km and an average of around 9 km. Taking this into account, a radius of 5 km was established around TPH, TXL, and BER as a first indication of the optimal area for the site location.

Furthermore, a literature review was conducted in an attempt to consolidate the criteria for optimal warehouse location in the context of humanitarian relief operations (Roh et.al., 2013; Nawazish et. al., 2022; Eligüzel et. al. 2023; Richardson et. al., 2016). The research led to three criteria established to compare TPH, TXL, and BER: infrastructure reuse (1), logistics (2), and research and innovation (3). Each of these general criteria encompass more specific requirements, which are described in the following paragraphs.

Firstly, the criterion of infrastructure reuse refers to the criteria of the location being located outside flood hazard areas, as well as two of the criteria presented by the Future Group. These are that the site should be located within the developed

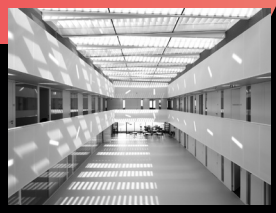
PREPAREDNESS

RESEARCH CENTER

VOLUNTEER CENTER

WAREHOUSE

RESPONSE



EMT BASE

Researchers

Volunteers

Emergency Medical Teams (EMTs)

Relief Cargo Staff

AIRSIDE

WAREHOUSES

Storage
- Temp. controlled space (18-23°C)
- Cold Room (below -5°C)
- Freezing room
- Flexible storage (20%)

Administrative Area
- Customs clearance
- Office
- Bathroom

(Un)loading Area
- Truck manouvering space
- Truck parking space
- Staging area

RESEARCH CENTER

Research
- Reception
- Laboratory
- Archive

Office
- Ext. meeting
- Int. meeting
- Office spaces

SUPPORT

Circulation
- Corridors, stairs, elevators

Common facilities
- Parking
- WCs
- Restaurant

VOLUNTEER CENTER

Training Area
- Simulation center
- Lecture rooms
- Service yard

Gathering Area
- Informal gathering
- Reception

Event Area
- Workshop space
- Conference hall

EMT BASE

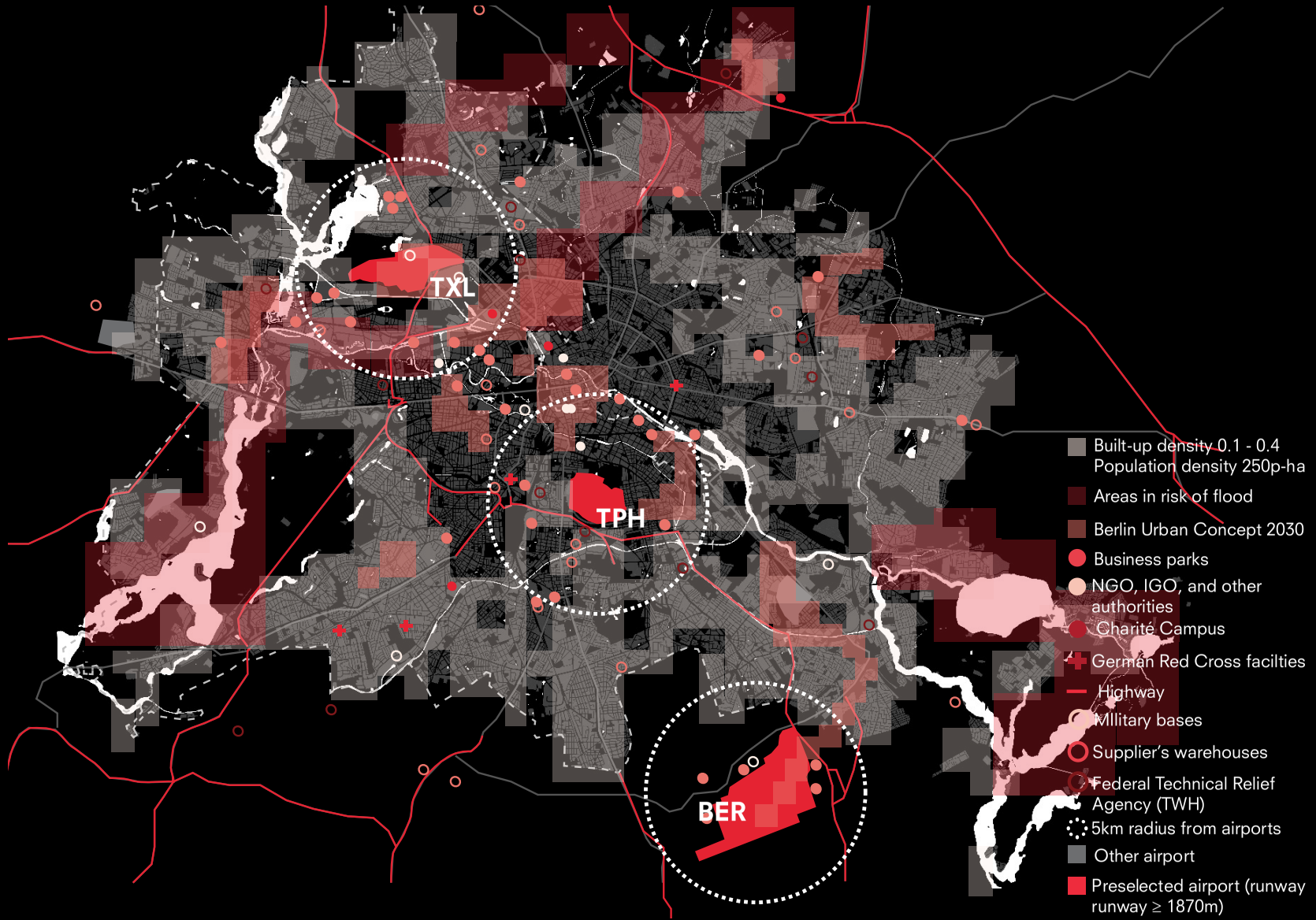
Accom.
- Dorms
- Reception

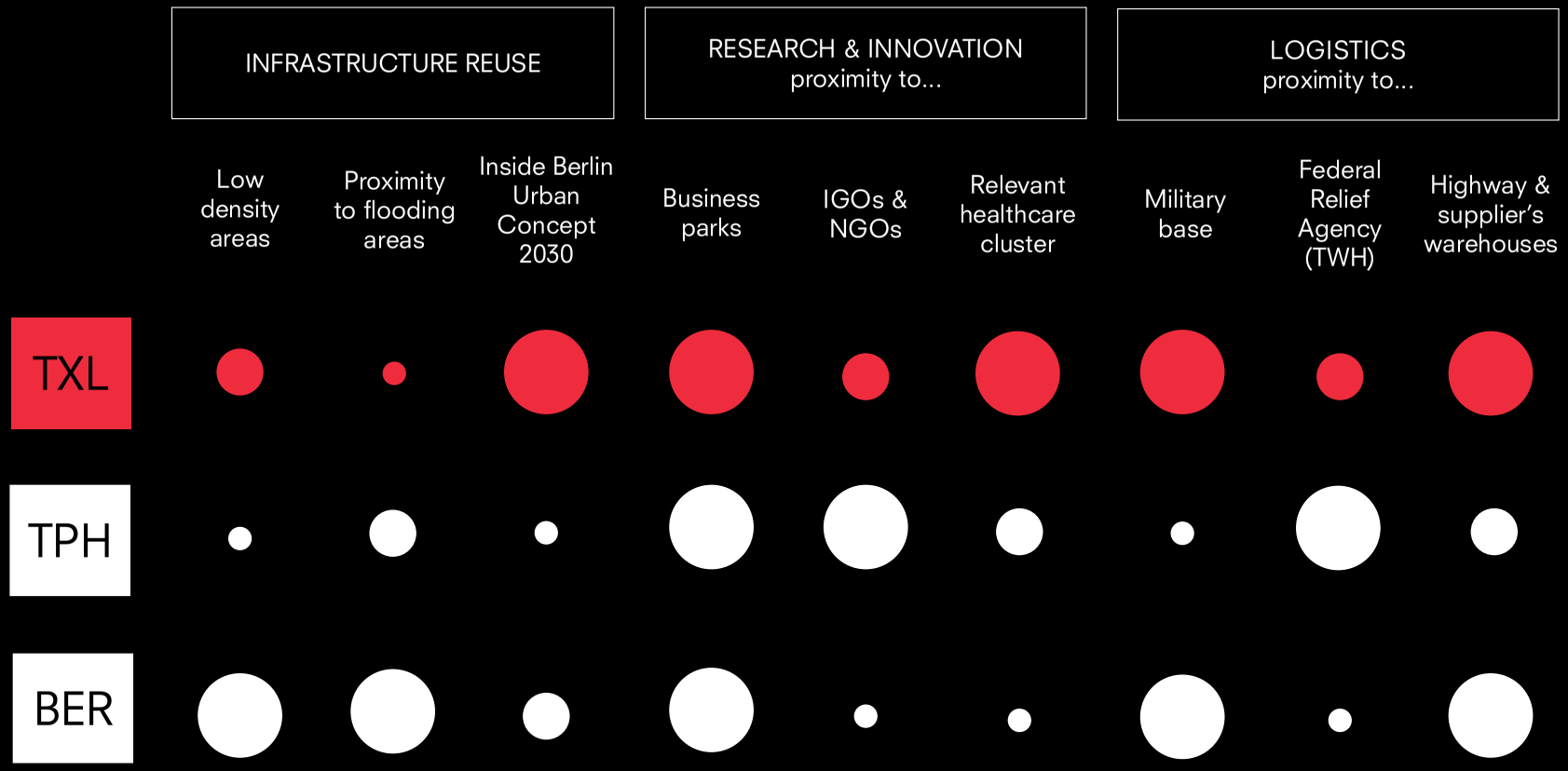
Facilities
- Pantry, Laundry
- Showers

LANDSIDE

Security barrier: Land- vs.Airside

Preparadness — Response


TXL
TPH
BER
Built-up density 0.1 - 0.4
Population density 250p-ha
Areas in risk of flood
Berlin Urban Concept 2030
Business parks
NGO, IGO, and other authorities
Charité Campus
German Red Cross facilties
Highway
Military bases
Supplier's warehouses
Federal Technical Relief Agency (TWH)
5km radius from airports
Other airport
Preselected airport (runway runway ≥ 1870m)


INFRASTRUCTURE REUSE
RESEARCH & INNOVATION
proximity to...
LOGISTICS
proximity to...
Low density areas
Proximity to flooding areas
Inside Berlin Urban Concept 2030
Business parks
IGOs & NGOs
Relevant healthcare cluster
Military base
Federal Relief Agency (TWH)
Highway & supplier's warehouses
TXL
TPH
BER

areas of the Urban Development Concept Berlin 2030 (1); and in an area that has a low density: built-up density area between 0.1 and 0.4 and a population density of 250p-ha (2). The third criterion of the Future Group, locating the site in a post 1990s built neighborhood (3), is disconsidered for the purpose of my project. This is because the criteria does not seem to directly reflect the potential for reuse possibility of the existing airports.

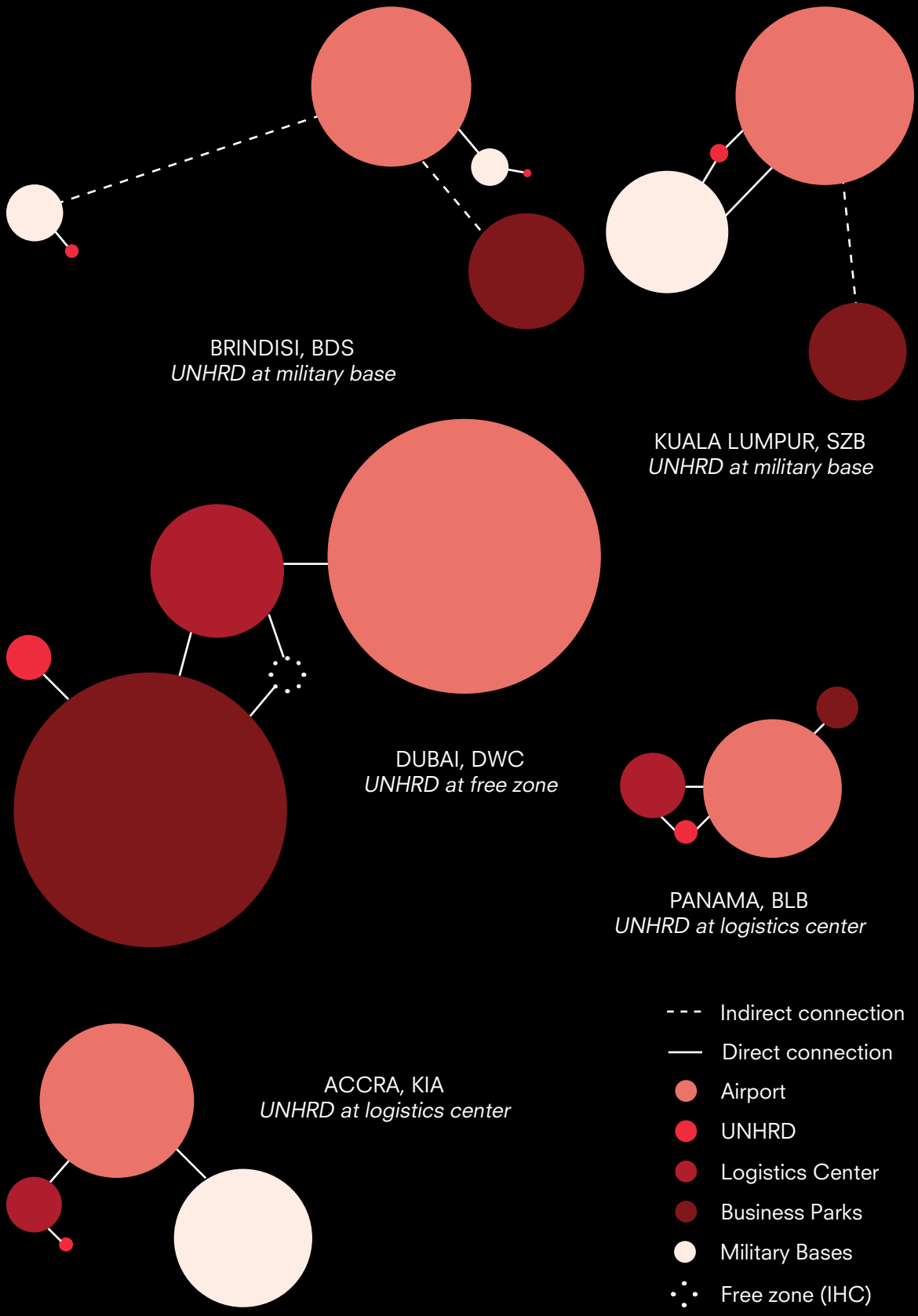
From the three pre-selected airports, only BER was built after the 1990s. Despite the fact that Tempelhof was built in 1923 and Tegel in 1948, both airports present great infrastructure reuse possibilities. This is not only due to the quality of their architecture, but also interestingly enough, due to the fact that they are non-operational airports. Tempelhof ceased its operation in 2008 and has been incorporated into the city as a park. Tegel ended its commercial flight operations in 2020 once BER was finally open, after nearly 30 years of construction (Flughafen Berlin Brandenburg GmbH, 2021). It can be argued that, in the face of a disaster, airports in high demand - such as BER - are more likely to be used for commercial aircraft operations. Therefore it seems to be preferable to assign other airports as disaster management bases (Hanaoka, 2013). Needless to say that this is only true if this alternative airport can efficiently perform humanitarian relief operations.

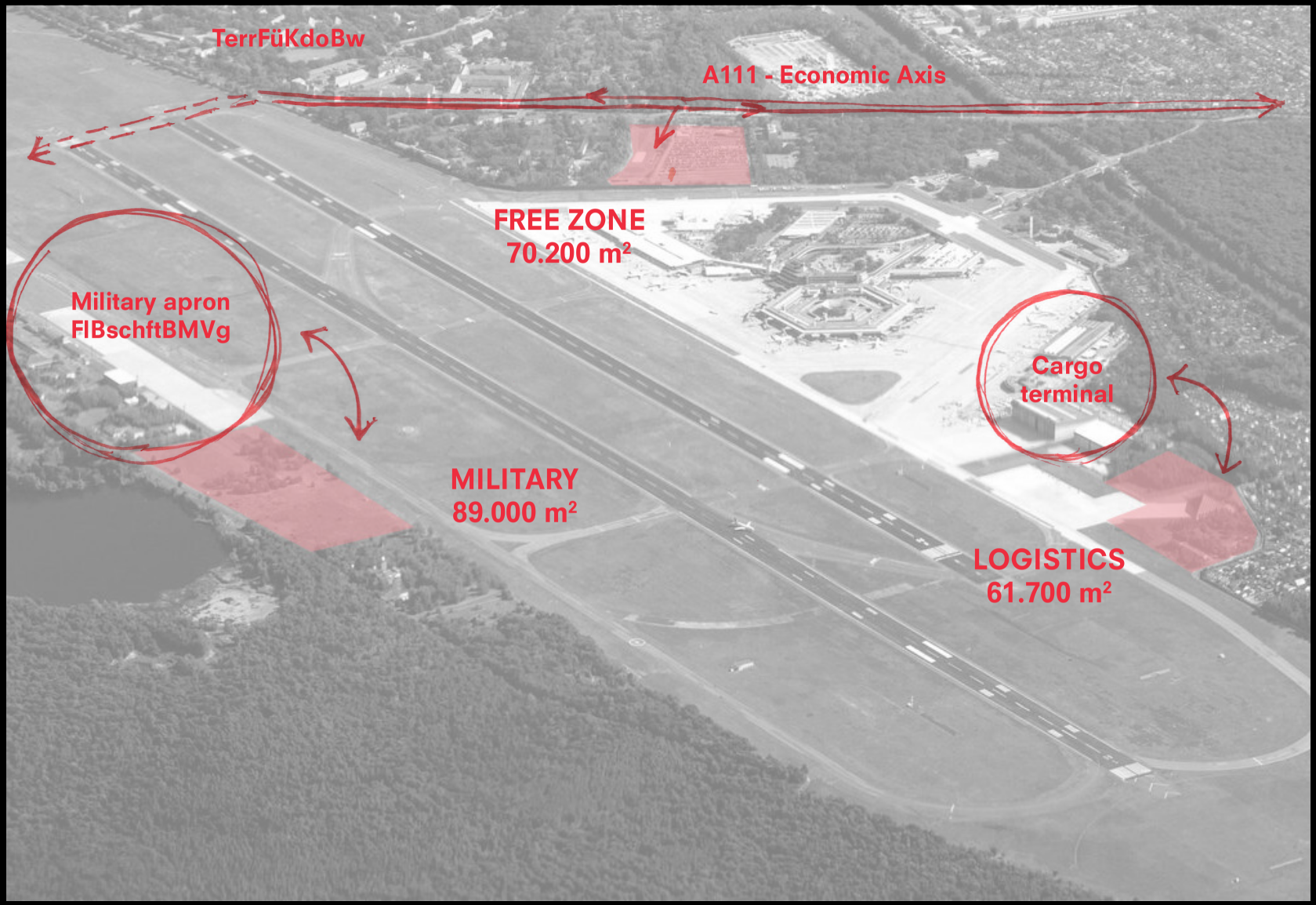
Secondly, the criterion of research and innovation takes into consideration the proximity to business parks, IGOs, and NGOs, and relevant healthcare clusters. These criteria are established based on the possibility of collaborating with multiple stakeholders in case of an emergency. From leveraging the capacity of healthcare clusters and of companies located on business parks to finance research and innovation, to the expertise detained by IGOs and NGOs to closely coordinate such initiatives.

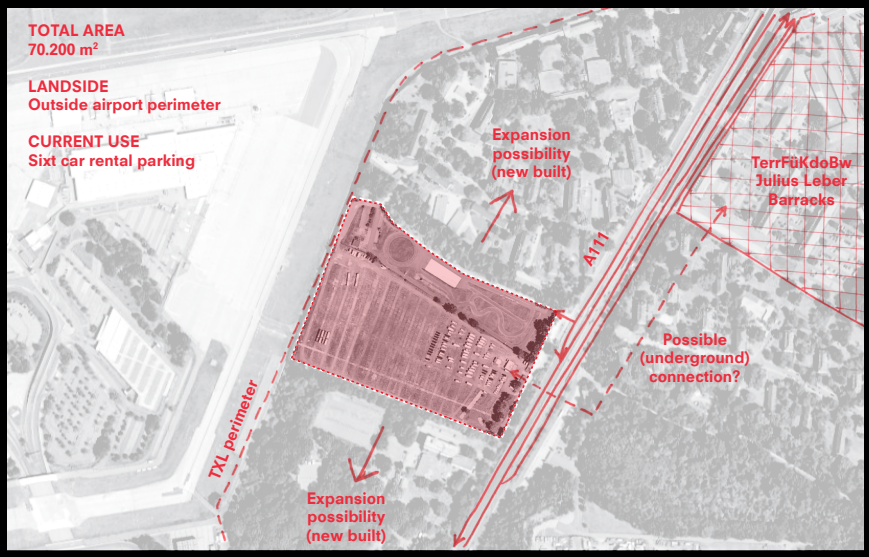
Finally, the criterion of logistics encompasses the proximity to highway, military base, supplier's warehouses, and Federal Technical Relief Agency (TWH). These criteria are selected with the focus on providing a timely response with the necessary skills in times of emergency.

The comparison of all these criteria has led to the conclusion that Tegel constitutes the most optimal site location. Firstly, considering the criteria related to infrastructure reuse, the choice for Tegel as a site is justified due to its prominent presence in the Berlin Urban Concept 2030 as a Urban Tech Republic, a research and industrial park for urban technologies (Tegel Projekt GmbH, 2024). Secondly, regarding the research and innovation criteria, Tegel was the best choice due to its proximity to around 8 business parks, and a relevant healthcare cluster, the Charité Campus Virchow-Klinikum. Lastly, in terms of the logistics criteria, Tegel is located close by more than 10 warehouse clusters and close by the Disaster Control Base of the Territorial Command of the Armed Forces (TerrFüKdoBw) established at the Julius Leber Barracks since 2020 and the Federal Ministry of Defense's Flight Readiness' (FlBschftBMVg) helicopter fleet, established in the military apron in the north area of the airport since 2018 (Bundeswehr, 2023a, 2024).

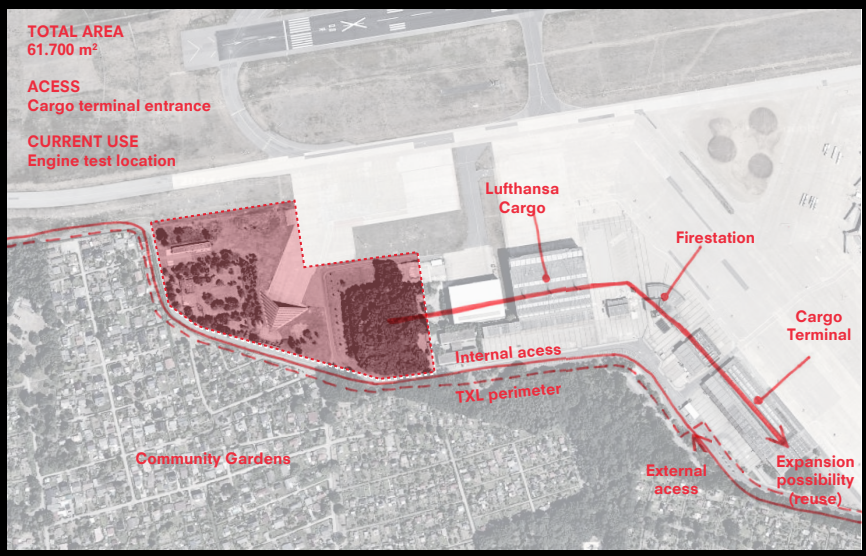
The TerrFüKdoBw is a higher command authority national immediately subordinate to the German Federal Ministry of Defense. It is responsible for the operational management of the Bundeswehr forces deployed in homeland security, domestic affairs, and disaster control. Its primary mission is National and Collective Defence, including the provision of assistance on the basis of international treaties such as the North Atlantic Treaty (for NATO) and the Treaty on European Union (for the EU). Furthermore, the TerrFüKdoBw is involved in activities related to international disaster assistance, during which it often cooperates with the German Red Cross. (Bundeswehr, 2023b). The decision to set up the command was made, among other

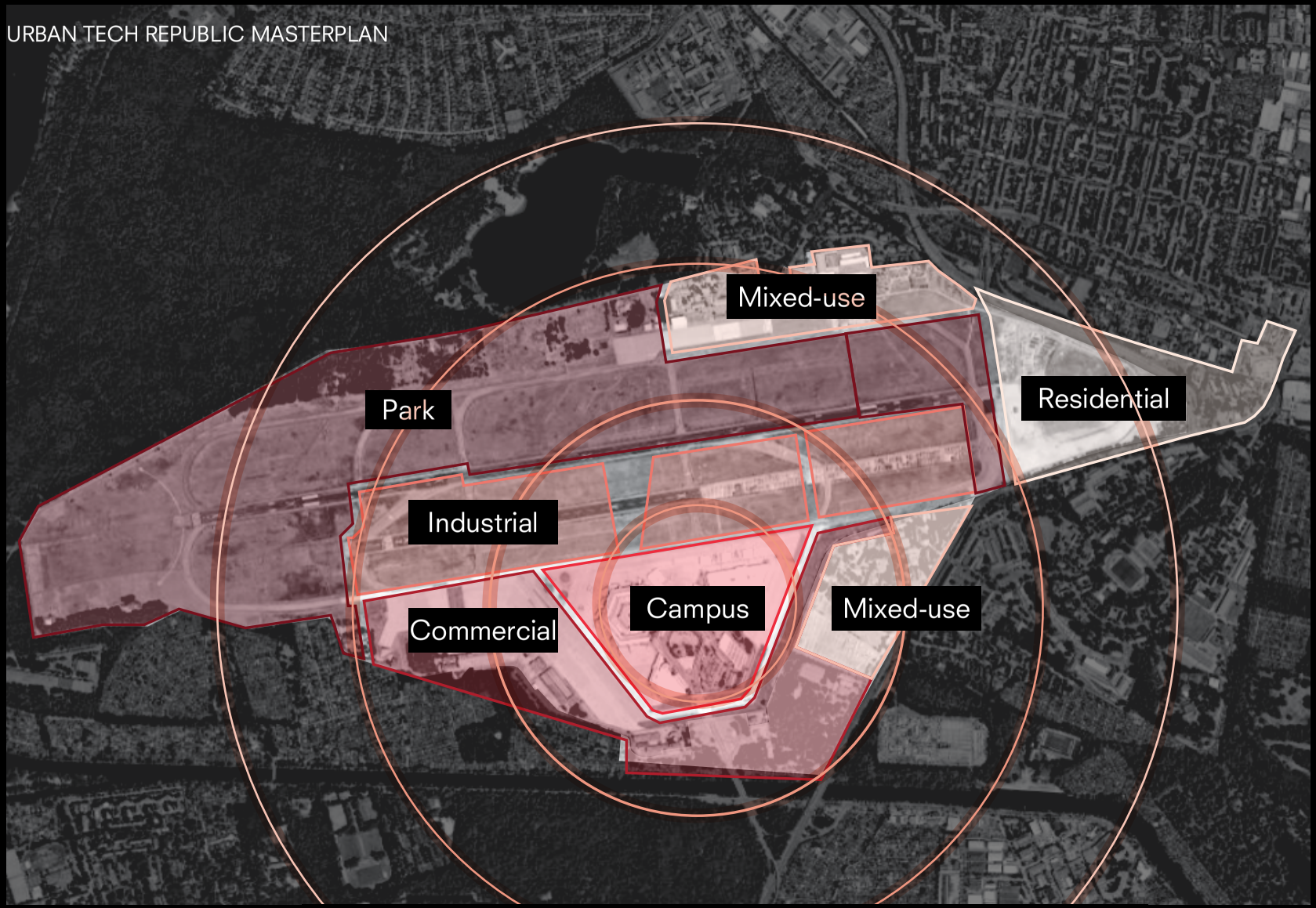

BRINDISI, BDS
UNHRD at military base
KUALA LUMPUR, SZB
UNHRD at military base
DUBAI, DWC
UNHRD at free zone
PANAMA, BLB
UNHRD at logistics center
ACCRA, KIA
UNHRD at logistics center
Indirect connection
Direct connection
Airport
UNHRD
Logistics Center
Business Parks
Military Bases
Free zone (IHC)


TerrFüKdoBw
A111 - Economic Axis
FREE ZONE
70.200 m²
Military apron
FlBschftBMVg
Cargo
terminal
MILITARY
89.000 m²
LOGISTICS
61.700 m²

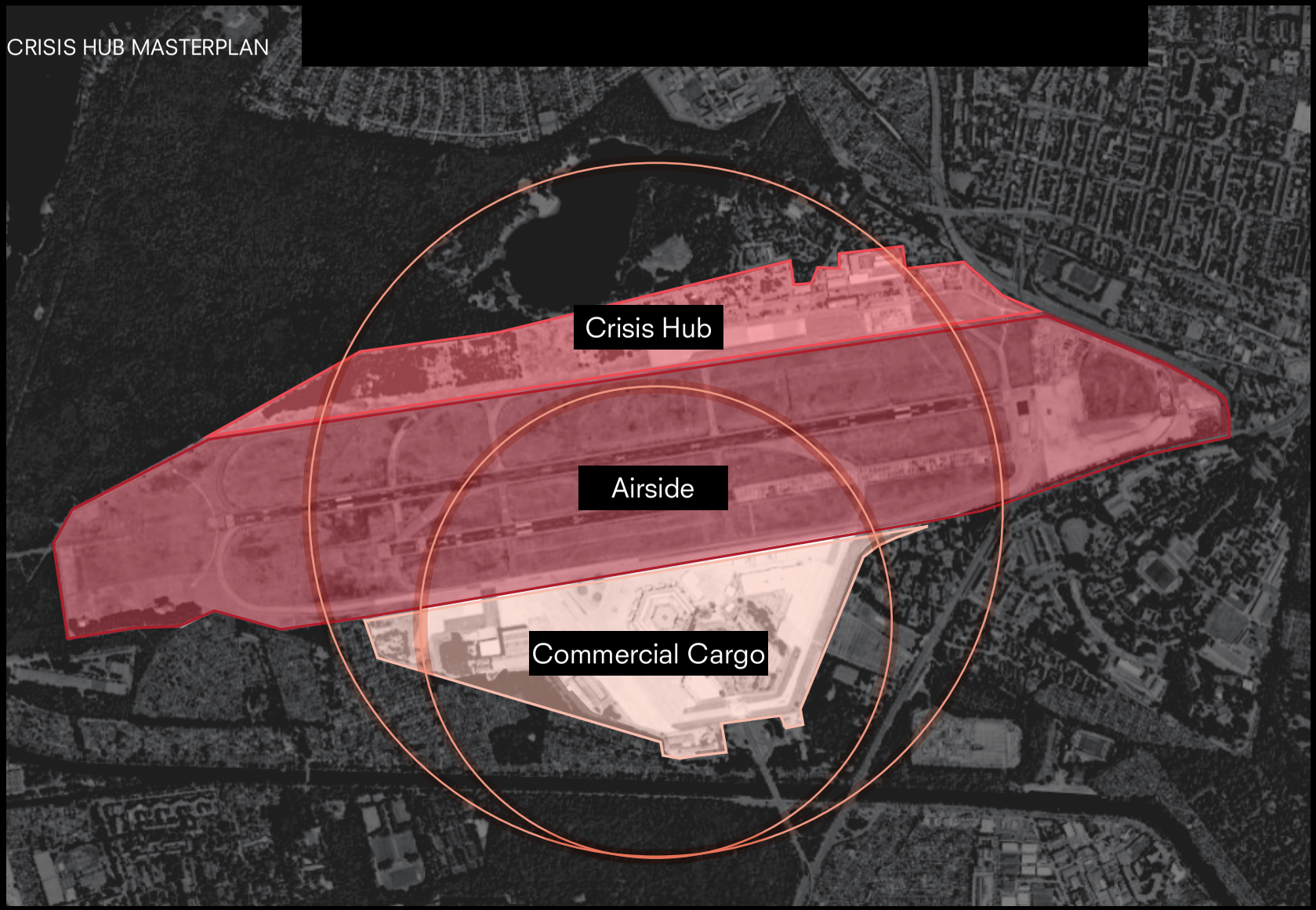

TOTAL AREA
70.200 m²
LANDSIDE
Outside airport perimeter
CURRENT USE
Sixt car rental parking
Expansion possibility (new built)
TerrFüKdoBw Julius Leber Barracks
A111
Possible (underground) connection?
TXL perimeter
Expansion possibility (new built)


TOTAL AREA
89.000 m²
AIRSIDE
Access via military apron
CURRENT USE
vacant
Jungfernheide Forst
Flughstensee
Federal Gov. Office
Bundesnetzagentur
TXL perimeter
Internal access
External access
FlBschftBMVg
Expansion possibility (reuse)
Military apron
Expansion possibility (new built)


TOTAL AREA
61.700 m²
ACESS
Cargo terminal entrance
CURRENT USE
Engine test location
Lufthansa Cargo
Firestation
Cargo Terminal
Internal acess
TXL perimeter
Community Gardens
External acess
Expansion possibility (reuse)


Mixed-use
Residential
Park
Industrial
Campus
Mixed-use
Commercial

CRISIS HUB MASTERPLAN



things, as a result of the experiences from the COVID-19 pandemic in Germany , the administrative assistance in the context of the flood disaster in July 2021 and in the wake of the Russian attack on Ukraine in 2022 (Wikipedia, 2024a).

The FlBschftBMVg, is the Executive Transport Wing of the Federal Ministry of Defence or, when literally translated, as Flight Readiness [Service] of the Federal Ministry of Defence. Its tasks are related to the worldwide transport of VIP personnel and materials, the transportation of sick and injured people, and flights under the Treaty on Open Skies. It is headquartered in the Cologne/Bonn Airport but it keeps remote operations of aircraft fleet in BER and helicopter fleet at the military apron at TXL. (Bundeswehr, 2024)

In conclusion, despite the fact that the Tegel airport has closed for commercial operations in 2020, the establishment of the FlBschftBMVg's helicopter fleet at the airport in 2018 as well as the TerrFüKdoBw's Disaster Control Base in its vicinity make a good case for the development of Tegel as Crisis Hub. Therefore, the idea is put forth to redevelop Tegel not as a Urban Tech Republic based on campus, commercial, and industrial functions. Instead of making the airport non-operational, the idea put forth through this project is to continue the airport operations as a commercial air cargo hub in normal situations and a center for humanitarian relief operations - a crisis hub - in case of need.

Airport scale

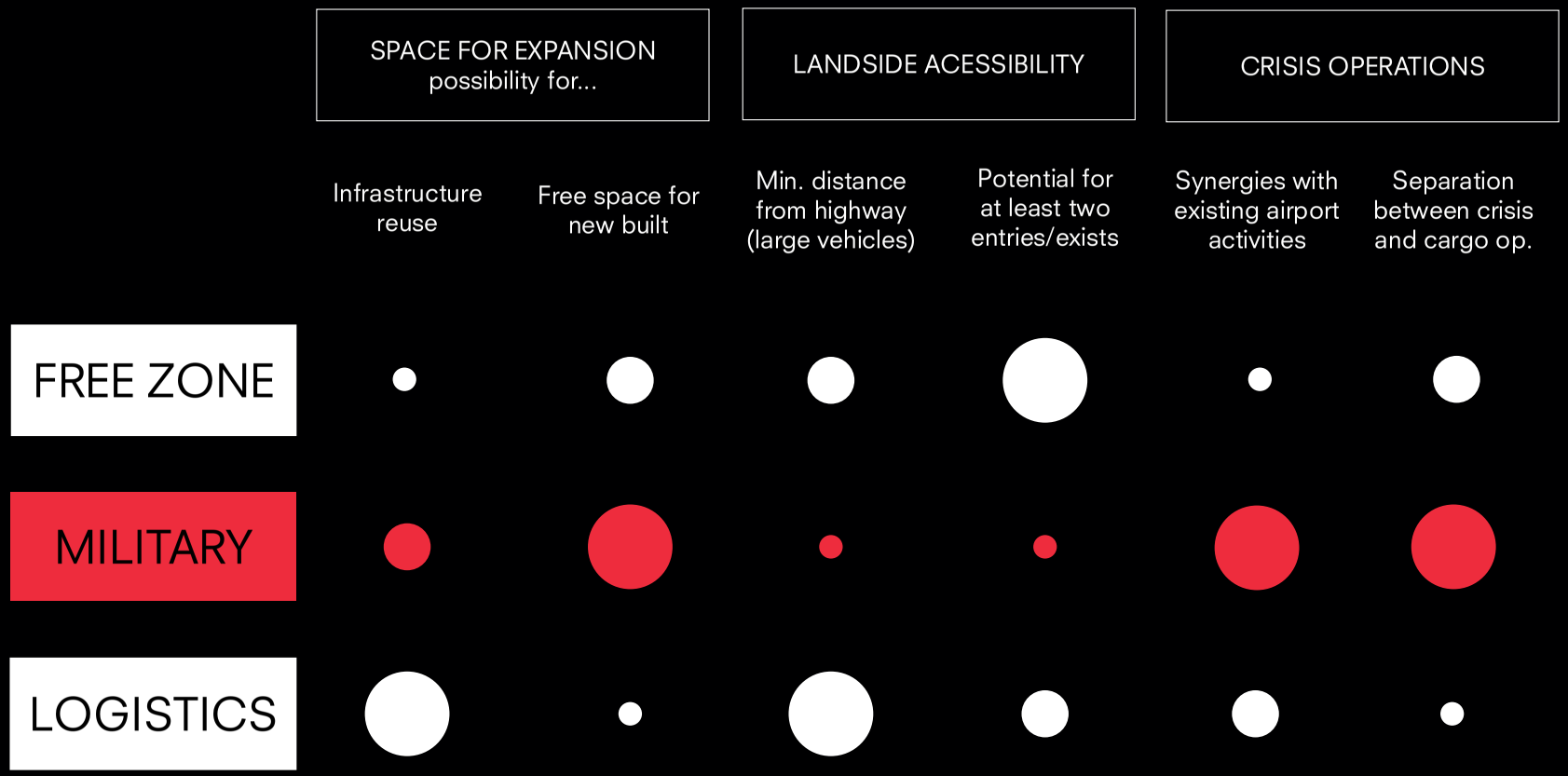
One of the criteria mentioned in the logistics category is related to the proximity to the military. This criterion has been given special attention due to the paradoxical yet crucial historical and present role played by the military in disaster relief operations. Further research on this criteria has underpinned the more zoomed in location analysis, at the airport scale.

On the one hand, it can be argued that the presence of the military can be beneficial, due to their logistical capabilities. This is due to not only their assets - such as aircrafts, ships and vehicles -, but also training and skills for dealing with crisis situations - for example fighting fires, distributing food and essential supplies, and restoring electrical grids and communications systems. Furthermore, large stockpiles of military rations maintained for warfare include blankets, tents, medical equipment, and field hospitals, which can be easily repurposed as humanitarian aid in times of crisis. (Angela J. Anderson et al., 2022)

On the other hand, the presence of military personnel in disaster-stricken areas raises ethical, political, legal, and bureaucratic issues. The action of the military forces beyond wartime can be considered inappropriate due to the inability to dissociate their presence with control, coercion and, ultimately, violence. It is argued that their presence can breed resentment and hostility among local populations. The question remains on whether military actors can be viewed as humanitarian actors.

"The protective emblem is a paradox: Whereas we try to make vehicles and uniforms unrecognizable by using camouflage, a flaming Red Cross on white ground is used on these camouflage colors at the same time. From the tactical perspective, this paradox only makes sense when the principle of expectation of reciprocity applies, which means the respecting of the International Humanitarian Law".(V. Uslar & Van Schewick, 2010, p. 3)

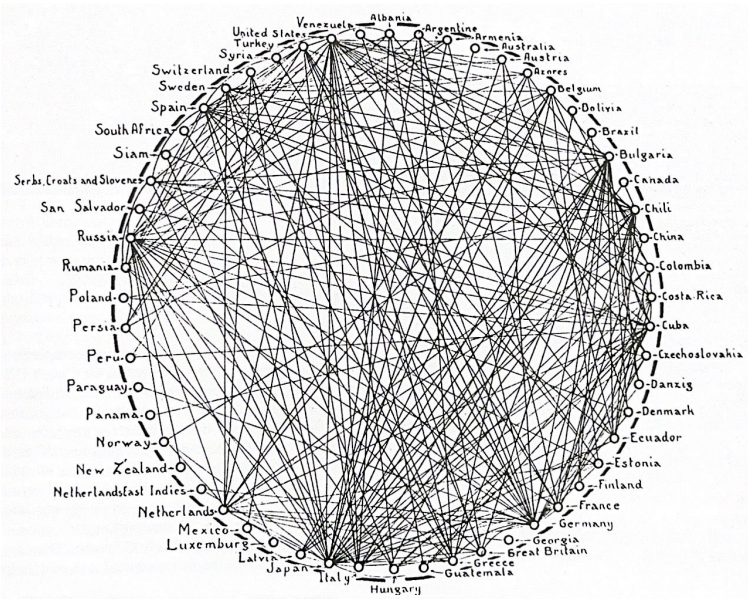
Despite this, an in-depth case study conducted regarding the UNHRD facilities shows that they are intrinsically related to military installations, with the exception of the depot in Dubai, which is located at a free zone. The drawing of bubble diagrams for each case study aims at simplifying their urban context and enabling further insights. This has led to the conclusion that there are, generically, three options for the location of a humanitarian warehouse


SPACE FOR EXPANSION
possibility for...
LANDSIDE ACESSIBILITY
CRISIS OPERATIONS
Infrastructure reuse
Free space for new built
Min. distance from highway (large vehicles)
Potential for at least two entries/exists
Synergies with existing airport activities
Separation between crisis and cargo op.
FREE ZONE
MILITARY
LOGISTICS

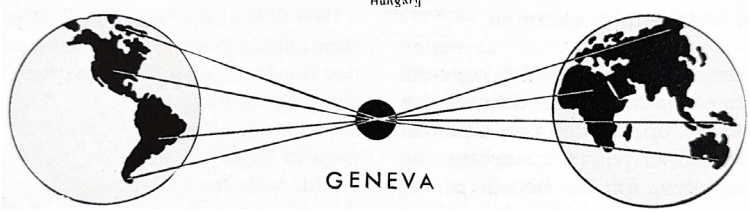
facility inside an airport: free zone, logistics center, and military base. Since no sufficient data was found to analyze the ICRC and IFRC facilities, the questions of the military involvement in the case of the Red Cross and Red Crescent Movement is tackled, from a historical perspective, in the client section hereafter.

The free zone, logistics center, and military base options were then translated into the context of the Tegel airport and each of these options was analyzed considering specific criteria set out for the airport scale. The criteria categories established within the airport scale were threefold: space for expansion, landside accessibility, and crisis operation. Firstly, space for expansion is related to the surge capacity inherent to humanitarian bases and it involves not only free space for new buildings but also possibility for infrastructure reuse (HADRA, 2022). Secondly, the land accessibility criteria are related to a minimum distance from highways and accessibility with large vehicles as well as the potential for at least two entries/exits (Kapucu et al., 2007). Lastly, the crisis operations criteria take into consideration the logistics of crisis situations, accounting not only for the synergies with existing airport activities but also for the ease of separation between crisis and normal cargo operations (Hanaoka et al., 2013).

In conclusion, the analysis of the three locations has led to the choice of the site next to the military apron, in the north area of the airport. This is justified, in spite of a comparably works landside accessibility, the best logistics of crisis operations. The site presents the greatest synergies with existing airport activities, considering the settlement of the FlBschftBMVg's helicopter fleet and the potential to separate the humanitarian relief operations in the north of the commercial cargo operations in the south. Furthermore, this site presents the greatest possibility for expansions (new buildings).



Bilateral collaboration between National Societies in the 1920s



Relief Bureau's logo in the aftermath of the Second World War

INTERNATIONAL RED CROSS AND
RED CRESCENT MOVEMENT

ICRC

German
Red
Cross

IFRC

INTERNATIONALCOMMITTEE
OF THE RED CROSS

1863

Former International Committee for Relief to the Wounded

Wartime

NATIONAL SOCIETIES

1863

The first National Society was established in Württemberg, now part of Germany

National Authority support

INTERNATIONAL FEDERATION
OF RED CROSS SOCIETIES

1919

Former League of Red Cross Societies

Beyond conflict

CLIENT

The proposed client for the project is the German Red Cross (Deutsche Rode Kruis, DRK). The DRK is one of the 191 National Societies of the International Federation of Red Cross and Red Cross Crescent Societies (IFRC), the world's largest humanitarian network, counting with 16 million volunteers (IFRC, n.d.-c). The IFRC is headquartered in Geneva and
it was created in 1919, in the aftermath of World War I, aiming to "improve the health of people in countries that had suffered greatly during the war" as well as to improve and expand the network of National Societies around the world (IFRC, n.d.-a). Today, the IFRC's mission is "to inspire, encourage, facilitate and promote at all times all forms of humanitarian
activities by National Societies" (IFRC, n.d.-b).
Apart from this, the choice has been made for the DRK as a client because the IFRC has a strong presence in Germany, where it is headquartered in Berlin. Only 16 National Societies, including the German Red Cross, have more than 1000 local units, representing 89% of the total (IFRC, 2021). The German Red Cross is the 3rd biggest worldwide, representing c. 35% of the 517k global Red Cross staff (IFRC, 2022).

The IFRC is part of the International Red Cross and Red Crescent Movement, which also encompasses the International Committee of the Red Cross (ICRC) and the National Societies (ICRC, .d.-a). The National Societies constitute the cornerstone of the movement, with the first National Society having been established in Württemberg, now part of Germany in 1963 (Reid & Gilbo, 1997). Guided by the principles of humanity, impartiality, neutrality, independence, voluntary service, unity, and universality, the movement's mission is

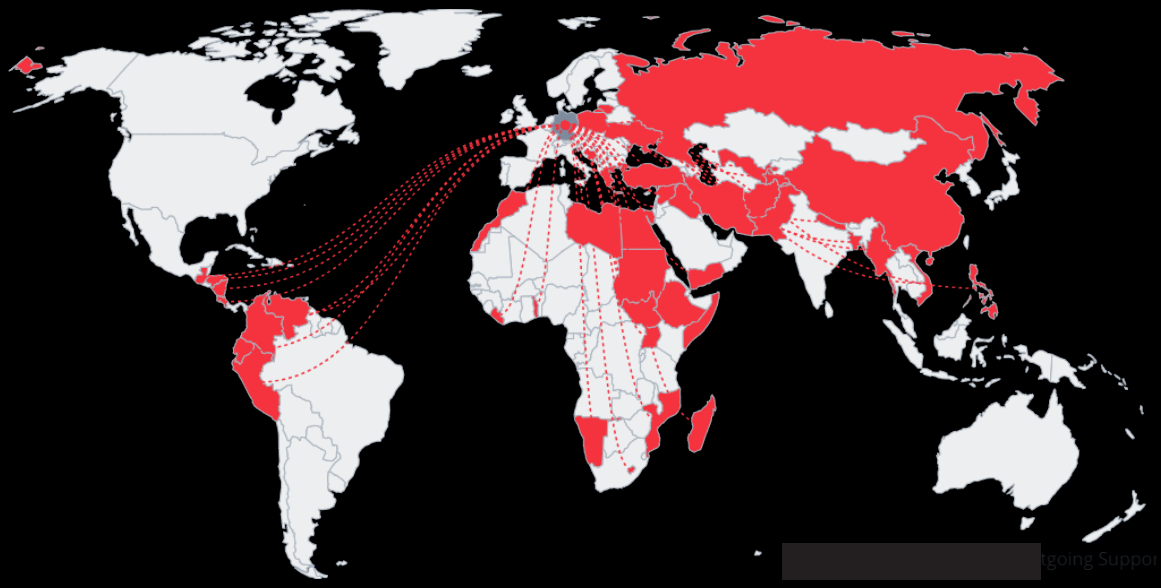
"to prevent and alleviate human suffering wherever it may be found, to protect life and health and ensure respect for the human being, in particular in times of armed conflict and other emergencies, to work for the prevention of disease and for the promotion of health and social welfare, to encourage voluntary service and a constant readiness to give help by the members of the Movement, and a universal sense of solidarity towards all those in need of its protection and assistance" (ICRC, n.d.-b).

In terms of the area of operation, the ICRC and the IFRC differ since the former is primarily concerned with armed conflicts and the latter with a wide range of humanitarian crises, including emergency and disaster relief. Established in 1863, the ICRC "is an impartial, neutral and independent organization whose exclusively humanitarian mission is to protect the lives and dignity of victims of armed conflict and other situations of violence and to provide them with assistance" (ICRC, n.d-a.). Moreover, the ICRC also acts as the guardian of international humanitarian law (IHL), which comprises "a set of rules which seek, for humanitarian reasons, to limit the effects of armed conflict" (ICRC, n.d-e.; ICRC, 2004).

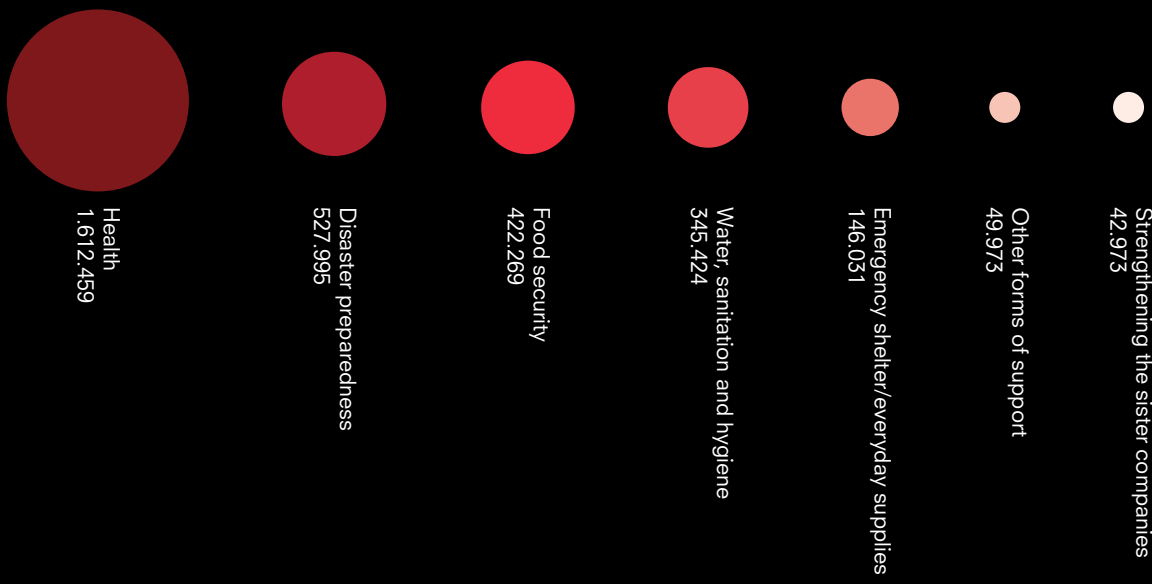
The origin International Committee for Relief to the Wounded (today referred to as ICRC) in 1863 can be traced back to the initiative of Henry Dunant, who took the initiative to organize aid for the wounded soldiers in the battle of Solferino in 1958. Since the beginning of the movement there was the question related to what could be the movement's purpose beyond conflict. As early as 1862, Dunant had written: "These societies could also render great services, by their permanent existence, in times of epidemics, or of disasters such as floods, fires or other natural catastrophes'" (Reid & Gilbo, 1997, p. 19).

Nevertheless, it was only through the establishment of the League of Red Cross Societies (today referred to as IFRC) after the First World War in 1919, by the initiative of Henry P. Davison, the President of the American Red Cross, that the actions of

CIRCA 3 MILLION PEOPLE REACHED GERMAN RED CROSS, 2022



REACHED PEOPLE IN NEED - GERMAN RED CROSS, 2022



the movement during peacetime were first formalized. The League's first task was to aid the populations of countries which had been most severely impacted during the war (Reid & Gilbo, 1997).

During the 1920s, the humanitarian relief operations of the League were characterized by a period of bilateral collaboration between National Societies. In 1927, the League of Nations established the International Relief Union (IRU) with overall direction under its own hands and executive authority for the direction of disaster relief invested in the hands of the IFRC. During the period of the Second World War, the IFRC and the ICRC worked in cooperation through the Joint Relief Commission, having delivered 165.256.256 tons of goods between 1941 and 1946 (Reid & Gilbo, 1997).

In the aftermath of the Second World War, the Relief Bureau, headquartered in Geneva, was created with the main function of offering reliable guidance to donors through the collection and dissemination of facts on humanitarian needs. For the first time, the League presented a systematic approach towards relief supplies, with the bureau being split in two sections: 'acute' (covering sudden disasters) and 'chronic' (handling the long-term results of war). It was also during this time that the League established its own warehouse facilities. (Reid & Gilbo, 1997).

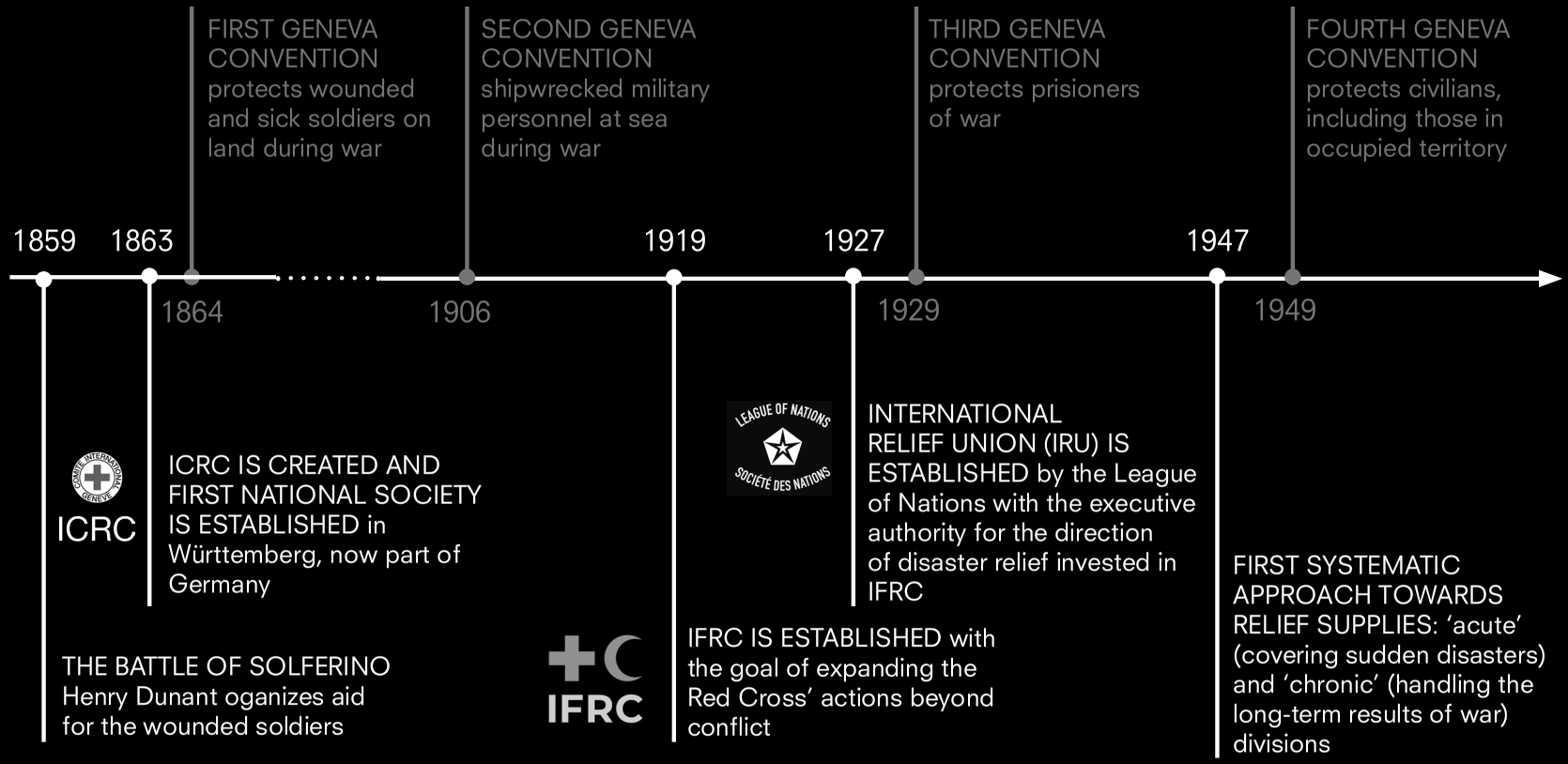
In the mid-1970s, with the publication of a strategic report named 'An Agenda for Red Cross' or 'Tansley Report' by David Tansley, a new strategic direction for the Movement was delineated. "The League [of Red Cross Societies] should aim to become the world's 'lead agency' in disaster relief (...). Its secondary function should be to assist National Societies to develop their emergency services, offering them assistance and evaluation on a consultancy basis" (Reid & Gilbo, 1997, p. 225).

Despite the fact that this objective has never been materialized, the IFRC plays a crucial role in the international humanitarian relief operations up until this day. This is illustrated by the responsibility invested in the IFRC within the UN Cluster System, being responsible to coordinate, alongside the United Nations High Commissioner for Refugees (UNHCR), the Shelter Cluster. The importance of the Movement in organization of global humanitarian relief operations is evident by the fact that 2% out of the 7.019 metric tonnes transported by UNHAS in 2022 corresponded to the humanitarian cargo belonging to the Red Cross and Red Crescent Movement.

More specifically, in relation to the German Red Cross, the establishment of public-private partnership between DRK and Lufthansa Cargo in 2016, evidence of the client's commitment to improve its humanitarian relief operations (Lufthansa Cargo, n.d). In 2022, the German Red Cross has reported to have reached circa 3 million people in 2022 (Deutsche Rotes Kreuz e.V., 2023). The items supplied were related to health, disaster preparedness, food security, water, sanitation and hygiene, emergency shelter, etc.

It is interesting to highlight that more than half of the people reached, around 1,6 million people were aided through the supply of health items. (Deutsche Rotes Kreuz e.V., 2023) This reflects also the historical relevance of the German Red Cross in the field of health relief, considering that the DRK was, during the Second World War, alongside Hungary, Switzerland, and the United States, a main supplier of pharmaceutical products (Reid & Gilbo, 1997).

Furthermore, when it comes to medical relief, the relevance of the Red Cross is further justified by the fact that the IFRC's Emergency Response Units (ERUs) are recognized as Emergency Medical Teams (EMTs) by the World Health Organization (WHO) (IFRC, 2024). In 2020, a collaboration agreement was signed between the WHO and the IFRC



History of Humanitarian Law
History of International Red Cross and Red Crescent Movement

to strengthen their collaboration in the delivery of emergency medical and health services during humanitarian crises (IFRC, 2020). The relevance of the agreement is reinforced by its renewal in the beginning of 2024 (WHO, 2024).

Looking into the future, the IFRC acknowledges the fact that crises are becoming increasingly more common, more concentrated, more complex, and more costly. First of all, crises are more common in view of extreme climate events and geopolitical crises. Second, more concentrated due to social-economical inequalities. Thirdly, classified as more complex because of increasing dependence on technology. Lastly, more costly as a consequence of the increasing population density in urban settings - particularly informal. In order to be able to prepare and respond accordingly, the organization sets out to be there at the right time, right place, with the right skills, and with the right focus (IFRC, 2023). This reported ambition is translated into the design ambitions for the proposed crisis hub.

STAKEHOLDERS

RESPONSE

WAREHOUSE & LOGISITCS

Federal Ministry for Economic Cooperation and Development

Federal Foreign Office

AVIATION

Lufthansa Cargo
Networking the world.

LOG WINGS OF HELP

AVIATION SANS FRONTIÈRES
ASF INTERNATIONAL

GOVERNMENT

amazon

DHL

KUEHNE+NAGEL

PREPARADNESS

SUPPLIERS

Technisches Hilfswerk

FLUGBEREITSCHAFT BMVg

RESEARCH & INNOVATION

CHARITÉ
UNIVERSITÄTSMEDIZIN BERLIN

BHT Berliner Hochschule für Technik

World Health Organization

CAPACITY BUILDING

BAYER

SIEMENS Healthineers

MAIN CLIENT

IFRC

German Red Cross

CRISIS ARCHITECTURE

ON PERSPECTIVE *from demand to supply* STANDARDIZATION

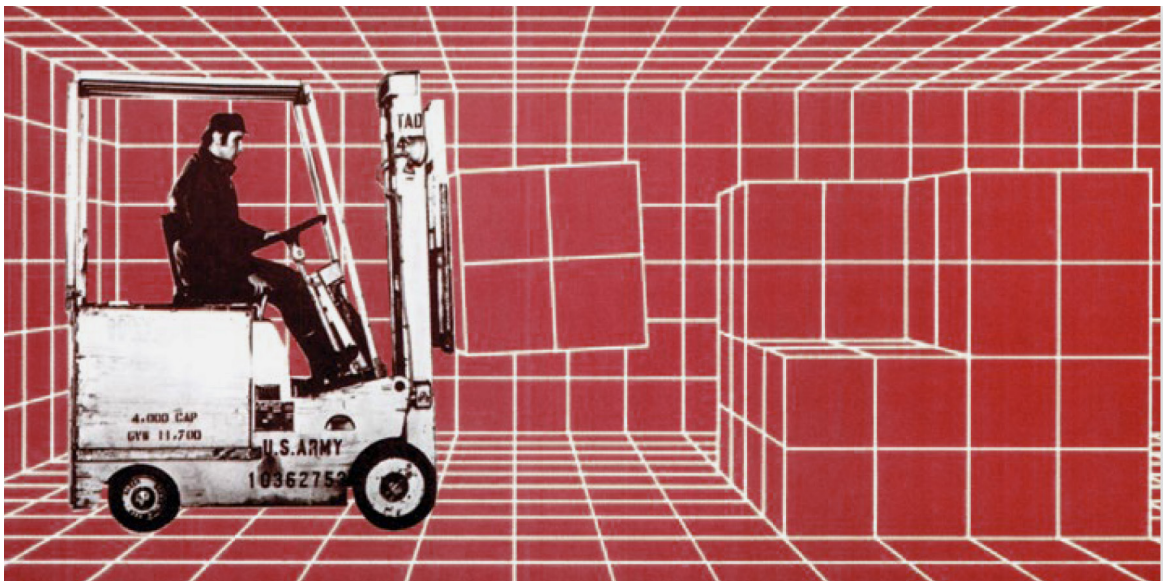
ON EXPRESSION *from humanitarian spaces to military bases* MODULARITY

ON TEMPORALITY *from transitional to permanent* SCALABILITY

ON ADAPTABILITY *from change of plan to change of function* SPEED

ON TOOLS *from contingency planning to scenario planning* CONTROL

ON MATERIALITY *from residual to resilient* EFFICIENCY



CRISIS ARCHITECTURE

ON PERSPECTIVE

There is a clear distinction between the perspective of supply and that of demand in the case of crisis architecture. On the one hand, demand is related to the architecture located in the disaster locations and is centered around the beneficiaries. An example of this is the construction of 500 standardized cyclone shelters built by the International Federation of the Red Cross (IFRC) in Bangladesh in the 1990s.

On the other hand, when it comes to supply, the focus is on the benefactors. In this context, the architecture typology that comes to mind is that of a warehouse. Designed in order to reach the ultimate efficiency of space, the warehouse space is standardized to meet the requirements of the item it stores. In the illustration below, this idea is conceptually shown by the merging of the stored product and the space itself into one indistinguishable whole (LeCavalier, 2016). This is also reinforced by the research which traces the width of the architectural grid of the warehouses to the width of the pallets, which are linked to the size of containers, which are finally related to the width of the Panama canal (College van Rijksadviseurs, 2019)

Furthermore, interestingly, there is a clear connection between the level of standardization that currently exists in warehouses and the development of technologies. The diagram below shows how Walmart was able to scale up its business, measured by the number of stores, in parallel to the development of technologies. Most notably, this can be illustrated by the development of the Universal Product Code (UPC) in 1978, the full roll-out of the handheld scanner guns in 1988, and the required implementation of Radio Frequency Identification (RFD) for the top 100 suppliers in the year 2000. (LeCavalier, 2016).

In general, the design of the optimal layout for a warehouse is measured by the criterion of travel time, the research related to the design of warehouses includes two design questions: facility layout and internal layout (or aisle configuration). On zoom out perspective, the first question relates to the placing of the warehouse programma, including receiving, picking, storage, sorting, and shipping. On a zoomed in scale, the second question concerns the placement of equipment, storage space, and paths (Dukic & Opetuk, 2012).

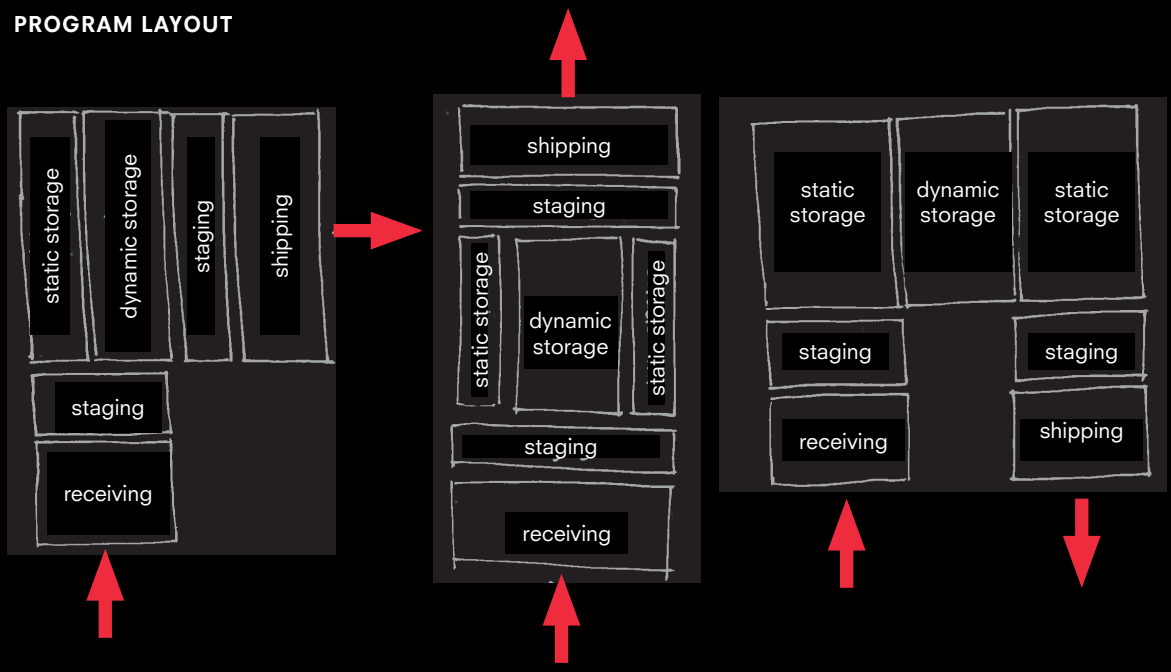
In relation to the first question, the research has focussed on the study of warehouse design and the general "L-", "U-", and "I-layouts". All are very process oriented, clearly illustrating the flow efficiency within the space as a guiding design principle. The main difference between the types seems to be related to the warehouse size and intensity of flow. While the U-shaped warehouse seems to be adequate for all warehouse sizes, the L-shaped layout seems to be the most appropriate for small to mid-sized warehouses, and the I-shaped layout for high volume warehouses. (Agatha Aviso & Meaghan Brophy, 2023).

Considering the second question, in relation to wayfinding in warehouses, alternative designs have been proposed by Gue and Meller (2009). The conventional warehouse design is characterized by a rectangular storage area with parallel aisles, including possibly one or more orthogonal cross aisles. This implies a S-shaped movement along the space for order pickers. Alternatively, Gue and Meller (2009) propose three new, more efficient, designs. The first involves "inserts a 'Flying-V' cross aisle into a warehouse with parallel picking aisles", which has proven to reduce worker travel time by 8 -12% (Gue & Meller, 2009, p. 24). The second alternative design "has 'fishbone' picking aisles which extend horizontally and vertically from diagonal ('spine') cross aisles" , which is claimed to be close to the optimal layout, reducing travel time by 20% (Gue & Meller, 2009, p. 24). Finally, the chevron aisles design offers a solution to a drawback identified in the fishbone layout, namely the existence of one single central P&D point. In terms of time efficiency gains, similar results as for the fishbone layout are expected (Gue & Meller, 2009).

FROM DEMAND

International Federation of the Red Cross (IFRC), 1990s
500 Cyclone Shelters, ?m2
Built - Bangladesh

PROGRAM LAYOUT

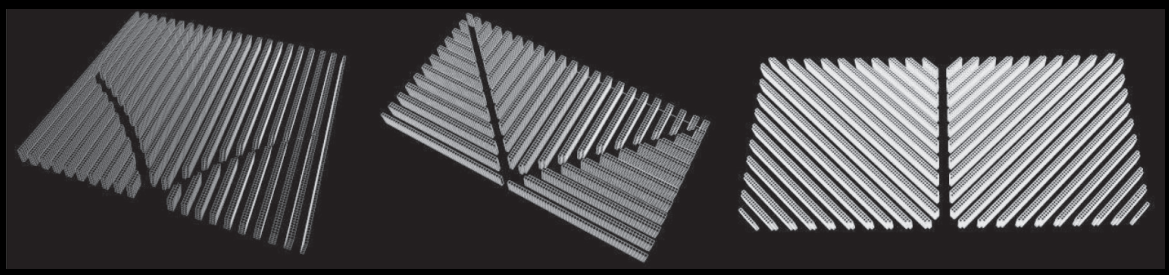


L-SHAPED LAYOUT
Small to mid-sized warehouses

I-SHAPED LAYOUT
High volume warehouses

U-SHAPED LAYOUT
All warehouse sizes

INTERNAL LAYOUT



FLYING-V

FISHBONE

CHEVRON AISLES

TO SUPPLY

CRISIS ARCHITECTURE

ON EXPRESSION

In general - even though there is space for debate -, demand crisis architecture is more often related to humanitarian spaces, while supply crisis architecture is more directly linked with military architecture. These two extremes of the expression spectrum are tackled below.

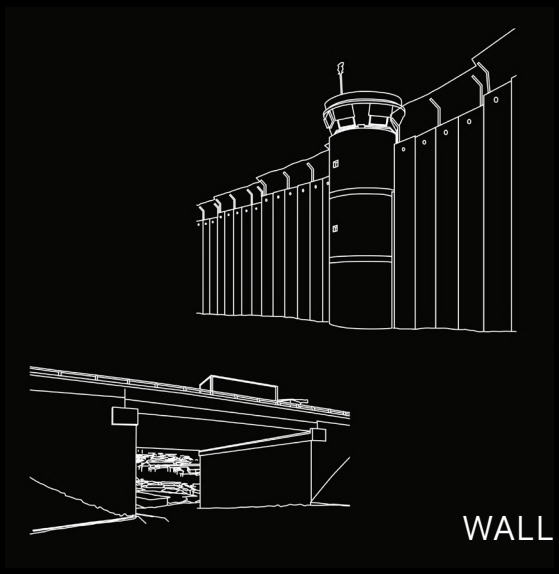
Humanitarian spaces can be described as "not territorial zones, but rather sets of operational categories, or spacebound circumstantial conditions, that make independent humanitarian work possible" (Ban & Aspen Art Museum, 2014), in other words, they are "the space in which humanitarian can do their job independently from outside pressures" (Tomasini and Wassenhove, 2009). The challenges related to the delineation of humanitarian spaces stems from the dynamic crisis environment and spatial constraints that can be originated due to security reasons or weather conditions.

Furthermore, its conceptualization can be at times paradoxal, since it can be established by non-humanitarian actors, such as government and military, in detriment of their supposed humanitarian principles (Tomasini and Wassenhove, 2009). The departing point for the development and analysis of humanitarian spaces are the following four typologies: tower, wall, shelter, and park (Clouette and Wise, 2017).

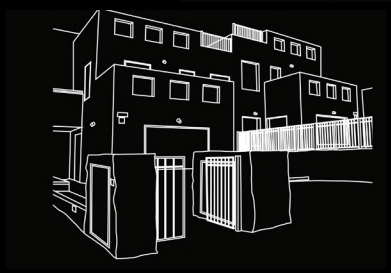
In relation to military architecture, the research has focussed on the spatial layout of the roman military camps. The logic of such camps is based on the concept of retention, holding from the enemy, and pretension, related to the preparedness state for battle. On the one hand, the retentura area includes functions such as quarters of officers, hospital, and horse stables. On the other hand, praetentura encompasses areas such as prison for hostages and safekeep for plunder, both characterized by their high security requirements. In these spaces, is the latera praetori. The word "praetoria" originates from the Latin word "praetorium," which relates to the residence of a praetor or other high-ranking official in Roman society. This middle part of the camp displays, apart from the commander's residence, functions related to administration (e.g. headquarters) and contingency (e.g. grain house) (Pete Wilson et al., 2018).

The flow within the roman military camps is organized by simple transversal roads that have a clear hierarchy within themselves. There are two main roads: via principalis, which separates the praetentura and the latera praetori, and the via praetoria, connecting the side closest and furthest away from the enemy. In the biggest camps, an additional street was created, the via quintana, separating the latera praetori from the retentura (Pete Wilson et al., 2018). Furthermore, the establishment of a via seguralis around the perimeter of the camp illustrate the need for redundancy in the design of routes. In other words, this circular street around the perimeter of the camp ensures the various spaces remain accessible if one of the other streets is blocked or destroyed.

FROM HUMANITARIAN SPACES



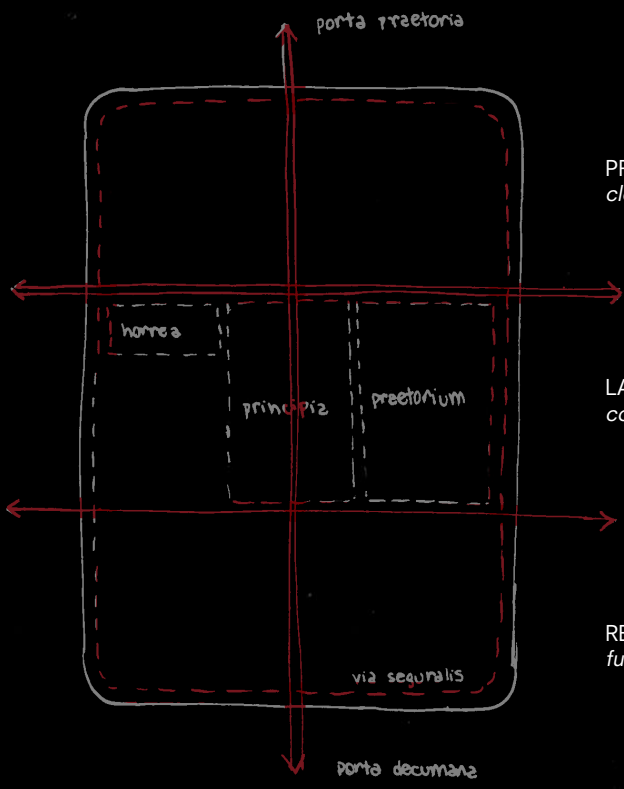
WALL



SHELTER

TOWER

PARK



PRAETENTURA
closest to the enemy

- quarters of officers
- hospital
- fabrica
- horse stables

LATERA PRAETORI
commandor's house

- headquarters
- commander's residence
- grain house
- tribunals

RETENTURA
furtherst from the enemy

- prison for hostages
- safekeep for plunder

ROMAN MILITARY CAMPS

TO MILITARY BASES

CRISIS ARCHITECTURE

ON TEMPORALITY

Considering the spectrum of time, a distinction can be made between transitional crisis architecture, such as refugee camps, and permanent crisis architecture typologies, such as a fire station and a prison.

Considering the refugee camps and their supposed ephemeral character, the research has provided interesting insight on the level of standardization, modularity and derived scalability of such typology. Based on the United Nations High Commissioner for Refugees (UNHCR) Emergency Handbook (UNHCR, n.d.), the minimum of 3,5 m2 of sheltered space and 30-45 m2 of land per person is established. As shown in the picture below, the refugee camp scales from the minimum requirements per person, per family (4-6 people), per community (80 people), block 1.250 people), sector (5.000 people), and module (20.000). According to the Handbook, scaling up beyond one module should be avoided (UNHCR, n.d.).

In relation to permanent crisis architecture typologies, the research has been focussed on prisons and fire stations.

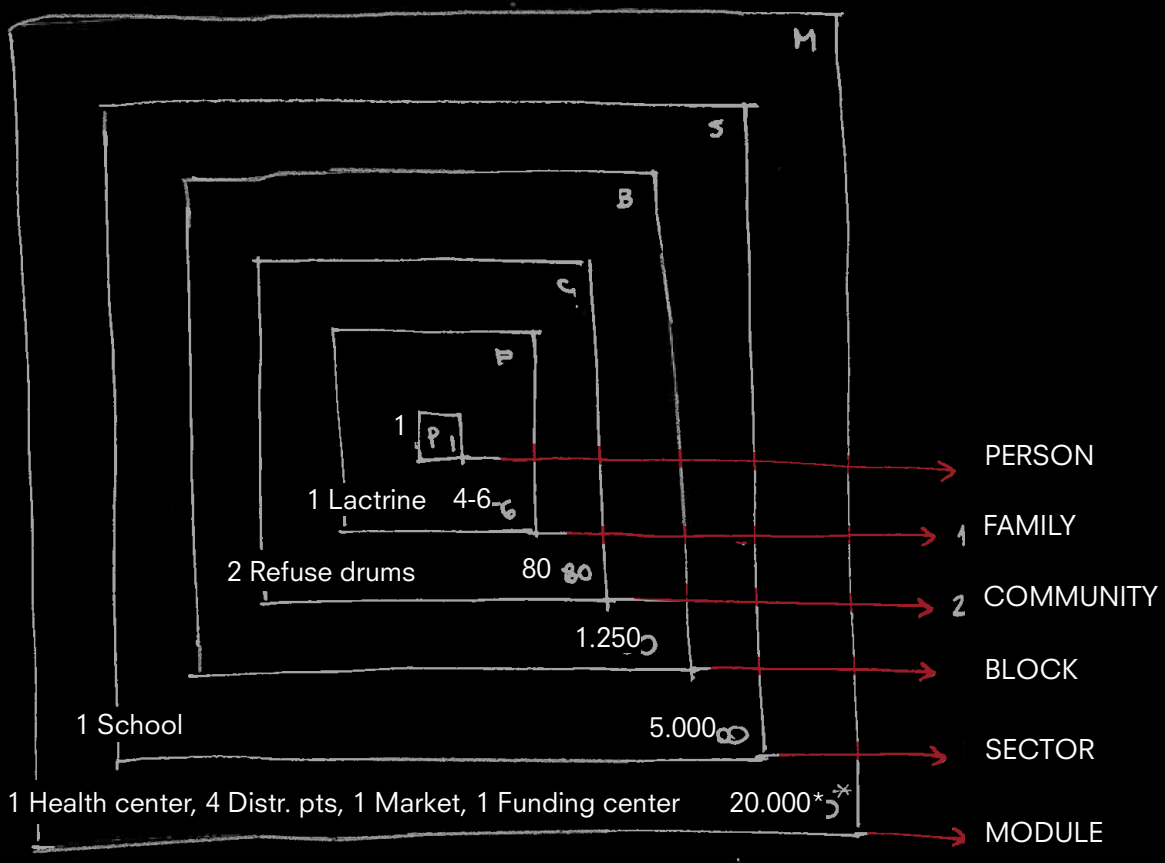
Firstly, in relation to prisons, the minimum standard measurements for a prison cell have been compared to the minimum requirements for a refugee camp. According to the United Nations Office for Project Services (UNOPS, n.d.), the minimum floor space for a one person cell should be at least 5,4 m2, which is circa 50% bigger than the sheltered space required for a refugee. Considering the scenario of shared accommodation, the minimum set standard is of least 3,4m2 per person, which is more in line with the requirements for the development of refugee camps (UNOPS, n.d.).

Furthermore, the research of prison typologies has enabled insights into methods of control, from the development of the spatial layout of prisons throughout the years to the different security layers that exist in prisons today. The circle/ panapticum, radial, cross plan, courtyard, and telephone phone layouts all have in common their efficiency in enabling the control of movements (in this case, of prisoners) in the building with the minimum amount of staff. By enabling clear sight lines through the building, the architecture design can aid in providing efficient security. In addition to this, the clustering of cells based on the level of security required is also a relevant tool for creating spatial efficiency and minimizing the risk of unauthorized movement. (Prison, Architecture and Humans, 2018).

Lastly fire stations are traditionally in terms of the following key spaces: apparatus bay, vehicle bay, administrative area, training area, day room, and dorm area (J. Paul Guyer, 2010). The research on the layout of fire stations has interestingly allowed for insights on the relation between the layout of fire stations and roman military camps. The same logic of praententura, latera praetori, and retentura which are the underpinning logic of the roman military camps, can also be identified in the layout of fire stations.

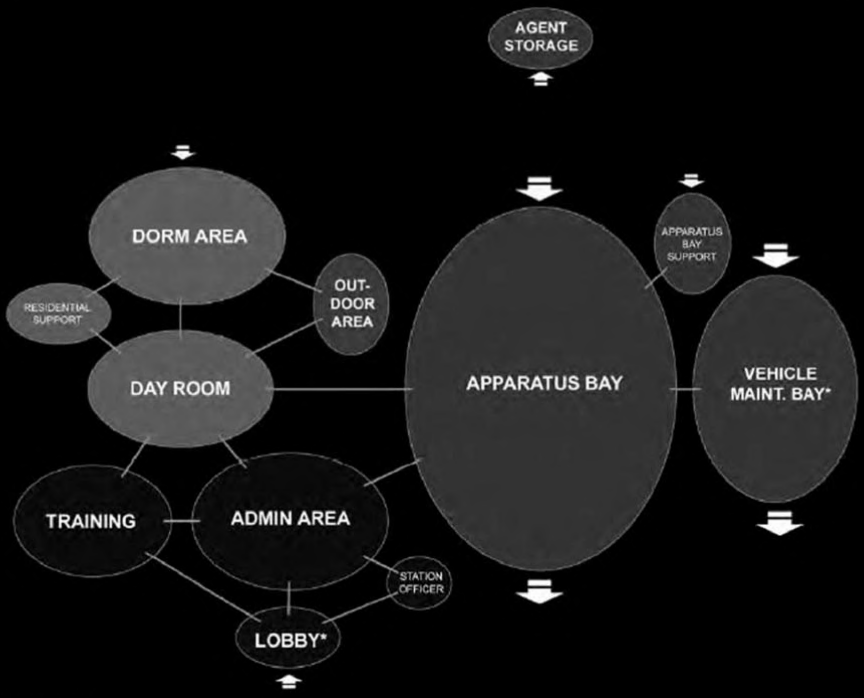
Firstly, the praententura, represented in the case of the military camps by the horse stables, is in this case represented by the apparatus and vehicles bay, from where trucks are ready to be deployed in case of a fire. Secondly, a parallel can be established between the headquarters and residential functions concentrated in the latera praetori of roman military camps and administrative area, training area and day room concentrated in the middle area of the program layout. Lastly, in terms of the retentura, which in the case of roman military camps would traditionally encompass a prison for hostages and safekeep for plunder, there is no direct equivalent for the fire station. Instead, what can be observed is that actually the dorms of the fireman are the most secluded part of the spatial layout, configuring what could then be classified as retentura, in the sense that it is the area most far from the enemy (or danger).

FROM TRANSITIONAL



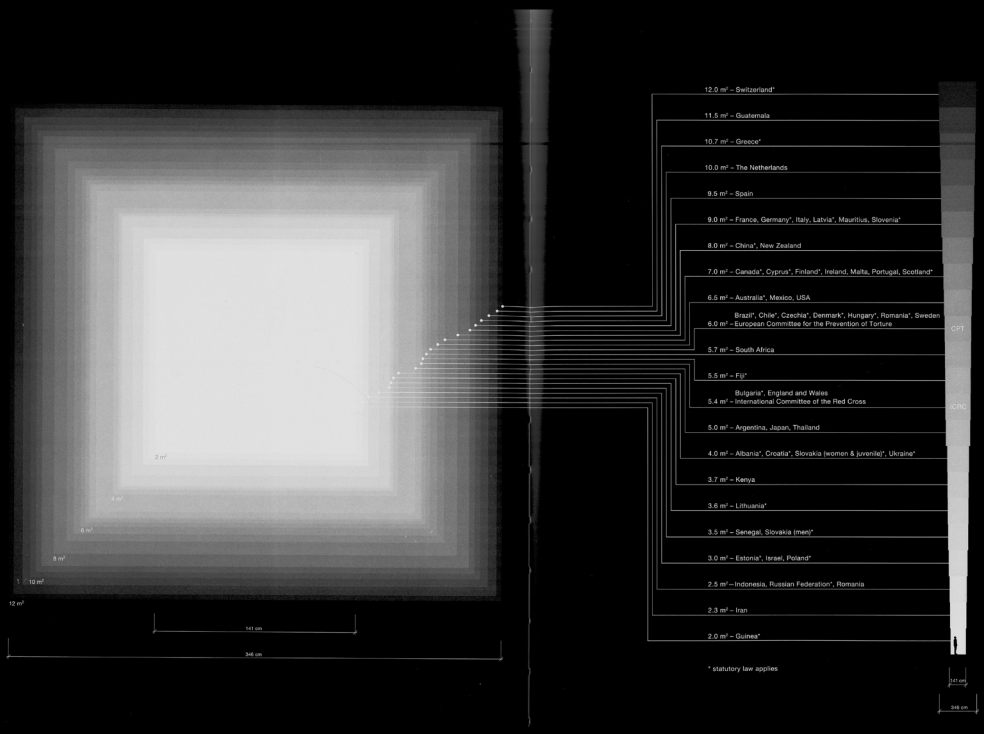
** Refugee camps larger than 20.000 people should be avoided*
** Minimum standard per person: 3,5m2 sheltered space; 30-45 m2 of land*

REFUGEE CAMP

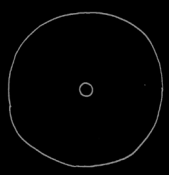


FIRE STATION

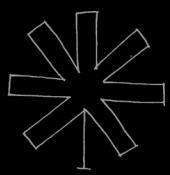
TO PERMANENT



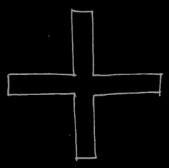
** Minimum standard per person:*
5.4m2, for single cell accommodation
3.4m2 per person, for shared accommodation



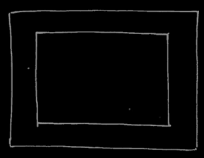
CIRCLE/
PANOPTICON
(1781-1821)



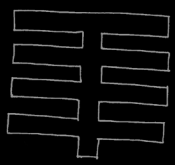
RADIAL
1821-1885



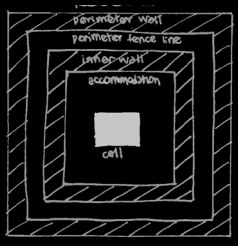
CROSS PLAN
1880s



COURTYARD
?

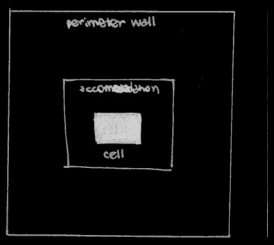


TELEPHONE
POLE
?

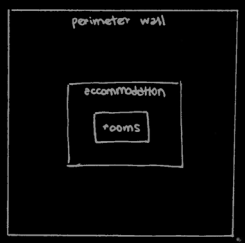


LEVEL 1

LEVEL 2



LEVEL 3



LEVEL 4

PRISON

TO PERMANENT

CRISIS ARCHITECTURE

ON ADAPTABILITY

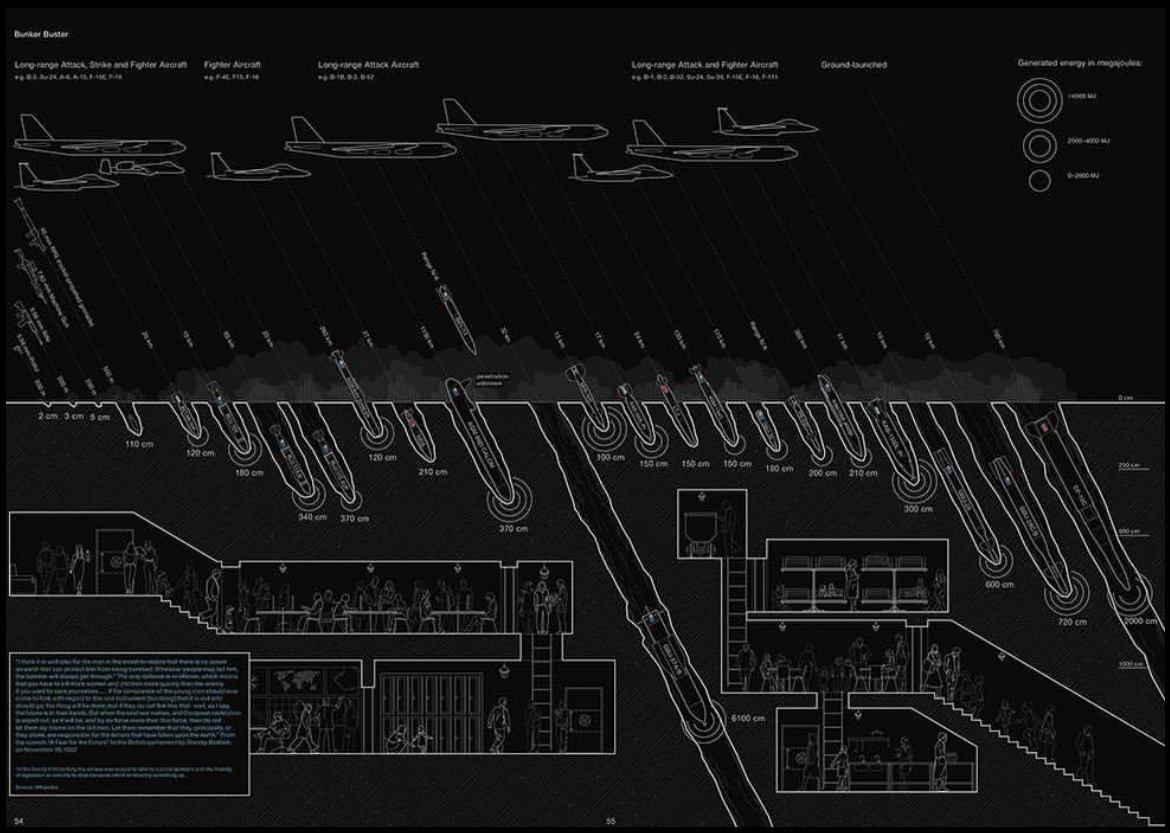
Focussing on the definition of crisis architecture from an archeological point of view, Driessen (1995) argues that "the recognition of 'crisis architecture' seems only permissible if the architectural record shows a combination of at least three features: (1) decrease of energy input in production and maintenance; (2) change of original plan; (3) change of original function" (Driessen, 1995, p. 67). In the event of a crisis leaving architectural traces in the form of ruins, it is argued that the crisis situation would induce some of these characteristics into the built environment.

Exceptionally, a different type of crisis architecture is identified which is fundamentally different because it involves significant new construction: 'warchitecture'. Defined as the defensive structures (e.g. fortification) and refugee camps, this category can only be classified as crisis architecture if it presents one of the features presented earlier. In other words, a refugee camp usually implies crisis architecture since it implies a change of plan.

The 'warachitecture' example of refugee camps clearly illustrates the crisis architecture of change of function. Considering the geographical focus of this research project, this can be illustrated within the city of Berlin through the establishment of refugee settlements in both the former Tempelhof and Tegel Airports. In 2015, Tempelhof was transformed into a refugee hub with capacity for 7.000 people, mostly triggered by the need to shelter Syrian refugees (Alison Smale, 2016). In a similar way, in 2022, the German Red Cross launched the "Labor Care 5000" in the Tegel airport, offering support for up to 900 Ukrainian refugees (Bayerisches Rotes Kreuz, 2022).

Evidently the question of change of function and change of plan are highly interrelated. A clear example that relates to change of plan is related to the access system of a building, which can be altered due to access restriction or increased defense needs (Driessen, 1995). Another example of change of plan is related to the introduction of new technologies and the subsequent adaptation of plans. This is clearly illustrated by the development of bunker architecture in parallel to the development of military weapons, most specifically related to missile technology. As war expanded into the vertical realm with the development of airplanes, defense went underground (Deutinger & McGetrick, 2018).

FROM CHANGE OF PLAN



BUNKERS

REFUGEE CAMPS

The former Tempelhof Airport as a refugee hub for Syrians refugees in 2015, capacity for 7.000 people

TO CHANGE OF FUNCTION

CRISIS ARCHITECTURE

ON MATERIALITY

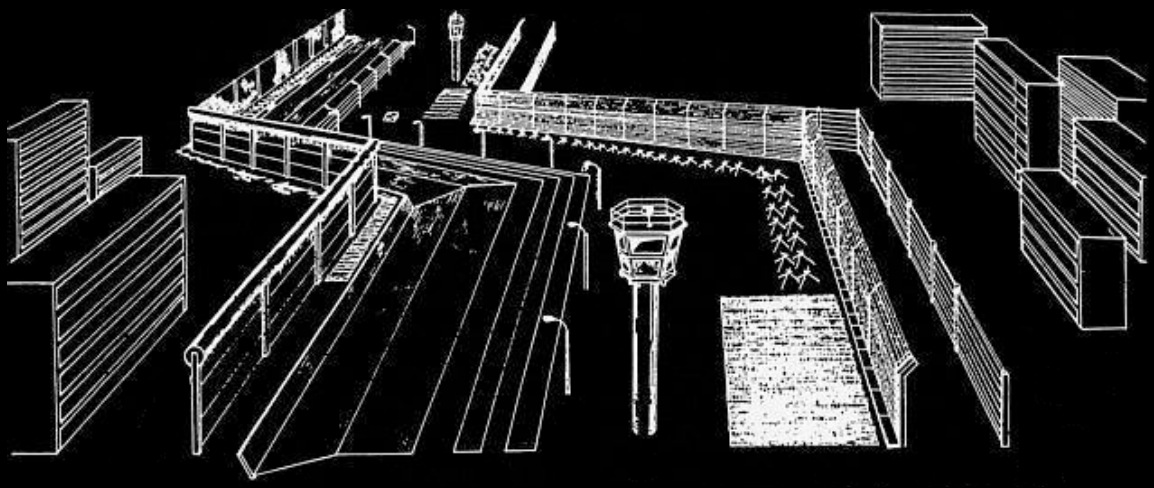
The framework of Driessen (1995), presented above, also directly relates to the topic of materiality of crisis architecture. This is because one of the three features that describes crisis architecture is "(1) decrease of energy input in production and maintenance" (Driessen, 1995, p. 67). This is exemplified by the example of fortification as 'warchitecture', which can only be classified as crisis architecture in the scenario of it being hastily built with whichever material is available, often with inferior quality standards (Driessen, 1995). In this sense, the construction of the Tegel airport during 93 days can be configured as crisis architecture if taking into consideration that the building materials utilized included tons of rubble remaining from wartime air raids. (Harrington, 2008).

Apart from residual material, crisis architecture is also intrinsically related to resilience. On the other end of the spectrum, resilience is related to a certain underlying need of control, security, and defense. This is shown through the development of the Berlin Wall which has evolved from an incipient wire fence in 1961 to the fourth generation of the wall in 1975 - a multi-layered security barrier which became known as "Grenzmauer 75" (Wikipedia, 2024b). The use of concrete, anti-vehicle trenches, sand and gravel, lighting systems, barbed-wire, and bed-of nails in the wall's fourth generation is a political as well as a military expression, which evidences the need for retention and control through the establishment of resilient barriers (Ionita, 2013).

FROM RESIDUAL

TXL CONSTRUCTION SITE, 1948

Tegel's was constructed in 90 days in 1948 by a civilian workforce of 17.000 people, out of which more than half were women. The construction materials utilized included tons of rubble remaining from wartime air raids.



WEST

"THE WALL" concrete

ANTI-VEHICLE TRENCHES concrete

STRIP CONTROL sand & gravel

COLUMN TRACK

LIGHTING SYSTEM high intensity floodlight

WATCH

VARIETY OF BARRIERS barbed wire & bed-of-nails

SIGNAL FENCE

BACKLAND WALL concrete

EAST

BERLIN WALL 1961-1989

The Berlin Wall evolved from a barbed wire fence in 1961, to its fourth generation in 1975, the *Grenzmauer 75.*

TO RESILIENT

CRISIS ARCHITECTURE

ON TOOLS

At an urban scale, the implications of contingency planning can be illustrated by the BERCON (Berlin Contingency). Considering that Berlin was an important enclave during the Cold War and in sight of the Berlin Airlift in 1948, the BERCON. was established in the 1950s by the North Atlantic Treaty Organization (NATO). The objective was not only to call for ground and air actions along the access routes and air corridors to Berlin, but also to possibly demonstrate the use of nuclear weapons.

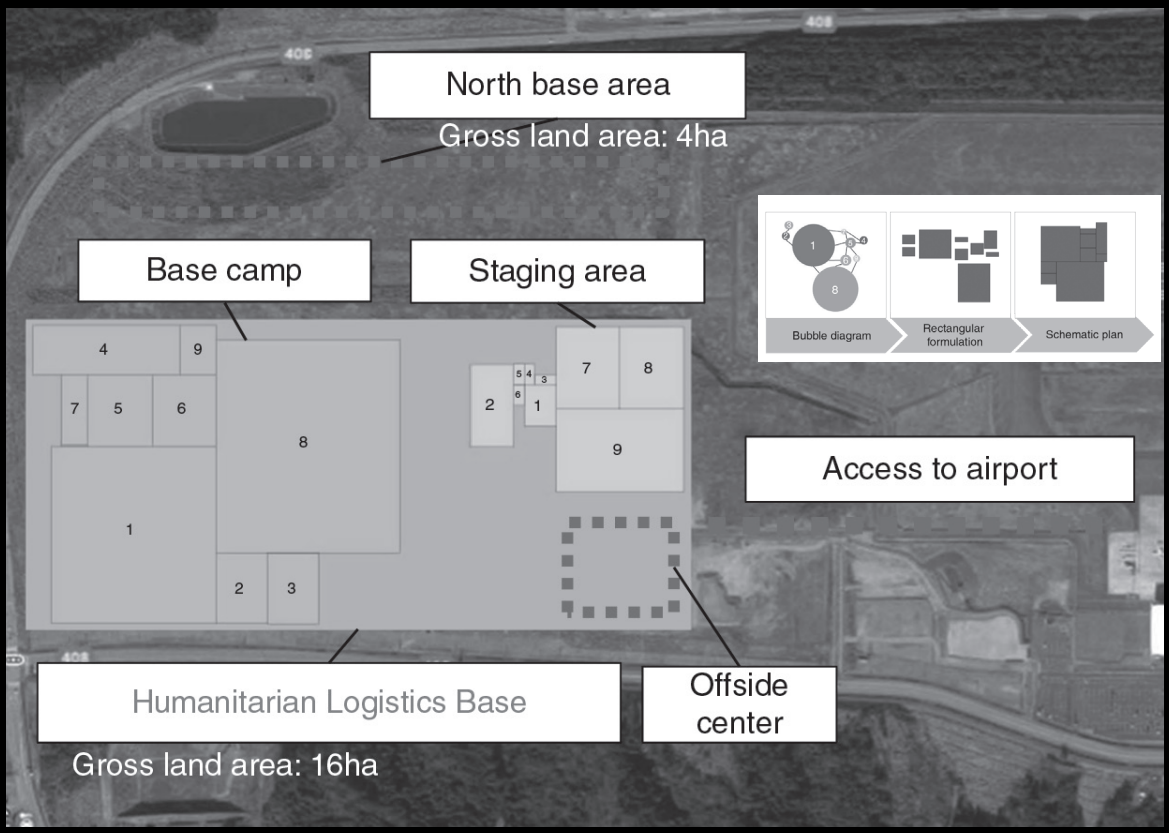
Zooming into the architecture scale, the Swissmill Tower - also known as Kornhuas - located in Zurich and designed by Harder Haas Partner Architekten in 2016 presents an interesting case study. (station.plus, n.d.) Located in the northern part of the city, along the Limmat river in a residential and industrial neighborhood close to the city center, the Swissmill Tower is a landmark. Between 2013 and 2016, the existing granary dating back to 1957 was raised in height from 38 to 118 meters (Harder Haas P. AG, n.d.). Currently, it constitutes the tallest operating grain elevator in the world (Wikipedia, 2023). The building has an area of 915m2 and a total volume of 75.000m3, with a total grain storage capacity of 28.000 tons (swiss-arc. ch, 2016) and a daily processing capacity of 800 tons (Wikipedia, 2023). The section of the building shows the massive hollow rounded reinforced concrete cells in which the grain is stored. Swissmill is the largest mill company in Switzerland, being responsible for 30% of the Swiss national grain requirements (Wikipedia, 2023).

The silo tower functions as a long term supply of grain and aligns with Switzerland's long tradition of preparing itself for crisis. The tower's primary goal is, supposedly, to guarantee the supply grain for the wider Zurich population in case of food scarcity. Nevertheless, it can be argued that the scale plays multiple roles that extend beyond mere contingency reasoning. As a massive concrete manifestation and ultimately being the biggest bank in Zurich, the tower plays not only a role as economic value generator, but also as a social moderator, an ecological case study, and a political design tool. (station.plus, n.d.)

FROM CONTINGENCY PLANNING

GRAIN TOWERS

Harder Haas Partner Architekten, 2016
Swissmill Tower, 118m, 915m2, 75.000m3
Built - Zurich



AIRPORT BASE CAMP
& STAGING AREA

Determining the approximate size and layout of a humanitarian logistics base in an airport based on the affected population and the number of emergency workers (Choi et. al., 2017)

TO SCENARIO PLANNING

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