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Climate Change Communication for Enhanced Urban Resilience

Communicating Urban Heat Stress through Visual Narratives

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Title

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Degree: Master in Urban Climate & Sustainability

Abstract (400-500 words)

Climate change communication has become the buzzword of the day. It has caught the attention of researchers, practitioners and change-makers. The climate communication discourse has been dominated by 'information-deficit' model-led science communication but given the inefficacy of this approach, the discourse is shifting from deficit to dialogue. Climate change communication has image problem and perceptual barriers. Under-addressing the image problem is a serious missing link in climate change communication. Visual media can be highly instrumental in influencing the perceptions of the viewer about various climate challenges and inspire them to engage with climate action. In the broader context of climate change induced urban heat stress in Germany, this thesis attempts to develop an understanding about the effective usage of documentary photography as a credible visual communication tool at city level, to enhance urban stakeholders' responses towards risk reduction and adaptation interventions for augmenting the urban resilience and amplifying the inclusive climate action. Using visual ethnography, a repository of urban heat stress visuals was created and visual frames were used to elicit the response from key stakeholders to understand their perception of the visual frames. This data was analysed to develop recommendations for effectively using photographic images in urban climate change communication. Results confirmed that Documentary photography can be used effectively to create visual frames of urban heat stress. The defining features of documentary photography make it a potent tool to capture visuals of urban heat stress. Visual frames and visual narratives open myriad possibilities of creating multiple engagements and dialogues. The locally rooted visual frames depicting everyday experience of heat stress, everyday vulnerability to extreme heat and peoples' agency to cope with the heat, resonate well with different stakeholders. People interpret visual frames and narratives differently, depending on their background, interest, and context of viewing. Selecting the right kind of visuals for communication is the key to engage with stakeholders more effectively and enhance their engagement with local climate action.

Keywords

Climate Communication, Urban Heat Stress, Visual Ethnography

Originality statement. I hereby declare that this Master's dissertation is my own original work, does not contain other people's work without this being stated, cited, and referenced, has not been submitted elsewhere in fulfilment of the requirements of this or any other award.

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Mayuresh Bhadsavle

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CHAPTER 1: INTRODUCTION

1.1.Rationale

Climate change is undoubtedly the crucial-most and complex challenge ahead of us. In the backdrop of the post-Paris landscape, climate change communication has assumed a far greater significance for accelerating public engagement, climate action and achieving the ambitious national net-zero targets. The widely recognized and popular understanding about climate change communication is driven by the Information deficit model (Suldovsky, 2017) and assumes the form of science communication. The discourse on climate change communication is also believed to be influenced by Environmental communication where impacts of climate change on environment and natural resources are highlighted through a range of nature-centric narratives (Katz-Kimchi and Goodwin, 2015). Climate Change Communication goes far beyond these two approaches, spans multiple disciplines, and is used as an umbrella term for all types of communications centered around climate change (Agin and Karlsson, 2021). However, the wide-ranging spectrum of climate change communication has paid scant attention to communicating multitudinal dimensions of urban climate change unfolding in cities.

On one hand, the Urban Centers and City-systems are major contributors to overall carbon emissions but on the other hand they are at the receiving end of the climate crisis. In the backdrop of rising global temperatures cities face climate hazards like extreme heat, flooding, sea-level rise, drought, and wildfire. Amongst all, Extreme Heat is a far more serious challenge because the impacts of heat hazards are compounded by the Urban Heat Island (UHI) effect, that further leads to the rise in urban temperatures. The risks and vulnerabilities associated with climate-hazards make this a grave issue on the front of climate justice. The techno-scientific, socio-economic and cultural-political aspects of the urban climate hazards need to be communicated to key urban stakeholders, for implementing effective risk-reduction and adaptation strategies at city-level. While there is no dearth of scientific knowledge about urban climate change, there is less awareness about the impacts of urban climate hazards amongst key stakeholders like policy makers, urban practitioners, media, and general public (Foss and Ko, 2019), (Elgendawy, Davies and Chang, 2020). The urban climate hazards, urban risks, vulnerabilities and adaptation solutions in general are highly underrepresented in the climate communication discourse. This observation is true not only for Global South but also for the Global North, known for advanced research on urban climate change and a well-developed climate communication discourse. When it comes to the efficacy of communication, Climate Imagery can be a great source of visual evidence to drive the point across the public mind but the available climate imagery and visuals are either cliched, abstract, emotionally distant or devoid of human stories. (Agin and Karlsson, 2021), (O'Neill, 2020). This leads to two major research questions:

1) How can Climate Change Induced urban stress, risks and vulnerabilities be communicated to key urban stakeholders through photography based visual narratives?

2) How can photography based visual narratives be used to enhance the stakeholder responses towards designing and implementing effective city-level adaptation and risk-reduction interventions for augmenting the urban resilience.

In pursuit of these research questions, this thesis has set aims and objectives as stated in the following section. Gratefully acknowledging the academic and social exposure to European Urbanscapes graciously offered by the Erasmus Mundus Masters Programme in Urban Climate and Sustainability and sensitively taking utmost cognizance of the climate crisis in European cities, the thesis focuses on challenges ahead of climate communication in Germany.
Cities face numerous challenges ranging from urban flooding to extreme heat stress. Unlike other climate challenges, urban heat stress is invisible to the human eye yet far more disastrous, especially for urban ecosystems and viability of cities (Crisman *et al.*, 2023). Different studies by Germany's national meteorological service, the Deutscher Wetterdienst (DWD) indicate that Germany can expect an increase in the number of hot days in summer and more pronounced, longer heat waves in future. German media company DW reported (DW 2022) that, Year 2022 was the year when Germany saw record-breaking heat, drought and hot days as the country was an average of 1.7 degrees C warmer than when the record keeping began. Considering the gravity of heat-challenges in Germany and the practical limitations of scholarly enquiry, the research focuses only on urban heat stress in German cities.

1.2. Aim and Objectives

In the broader context of Climate Change Communication and Urban heat stress in Germany, this thesis aims to develop an understanding about the effective usage of documentary photography as a credible visual communication tool at city level, to enhance urban stakeholders' responses towards risk reduction and adaptation interventions for augmenting the urban resilience and amplifying the inclusive climate action.

- Recognize major gaps in existing discourse on climate change communication and identify the specific requirements for communicating climate change induced Urban Heat Stress and vulnerabilities.
- Using documentary photography, develop a visual repository of climate change induced urban heat stress and vulnerabilities, as a grassroot level visual evidence.
- Explore the potential of 'Documentary Photography' as a credible tool to engage with key urban stakeholders to communicate the city-level impacts of climate change induced heat stress and the local adaptation solutions.
- Present a set of recommendations for effectively using photographic images in urban climate change communication to influence the informed decision-making, advance planning, and inclusive climate actions towards augmenting Urban Climate Change Resilience and amplifying the inclusive climate action.

1.3. Methodological Approach

The stated research problem requires a subjective treatment, detailed description of observations as a researcher as well as collection of photographic data, contextualization, and interpretation of the photographs. In view of these requirements, I will apply qualitative methodology to address the aims and objectives of research. I propose to use Visual Ethnography methodology, that has roots in anthropology and ethnography. Visual ethnography offers a substantive base to document the human face of urban heat stress, using documentary photography method. With an interpretivism philosophy, Inductive approach, field-based investigation strategies, cross sectional time horizon the research investigation will use following methods for the data collection and analysis:

- Archival Research and Secondary Literature Review of the media reportage on climate issues and communication of risks.
- Interviews with different stakeholders and actors to understand about risks and vulnerabilities perceived and experienced by different actors.
- Photographic documentation of local impacts of climate change induced urban heat stress, more in the fashion of evidence gathering and later to be used for data analysis.
- Photo-Elicitation Workshop followed by Focused Group Discussion to understand the interpretation of climate visuals by three key stakeholders, Policy Makers-Bureaucrats, Media Professionals-Researchers-Academicians and Urban Practitioners-NGOs.
- Field-visit, Observations, and Informal Conversations to understand people's responses to visual imagery of localized impacts of climate change.

1.4.Results, Analysis and Recommendations

Developing a visual repository of heat-stress photographs will be a crucial development for the research, firstly because the exercise is dependent on external factors like heat stress on a particular hot day in a particular city. The repository will also create visual evidence, which will be important to receive feedback from key stakeholders.

This feedback will be compared with other published results to discuss similarities and differences between the works. It will eventually lead to discussion, conclusion, and a set of recommendations for effectively using photographic images in climate change communication of urban heat stress.

CHAPTER 2: LITERATURE REVIEW

Climate change communication has become the buzzword of the day, especially in context of the UN Decade of Action. It has not only become a topic of intense scholarly interest but has also caught the attention of practitioners and change-makers. Climate change communication is meant for persuasion, mobilization, and deliberation. It persuades individuals to change their own energy consumption and adaptation, it fosters mobilization for collective action for behavioural change and through deliberation, it leads to collective efforts to identify problems and solutions. (Johnson, 2012). The salience and significance of climate change communication differs from actor to actor, depending on their strategic choice. In the particular interest of this research, we will focus more on knowledge and practice.

2.1 Climate Change Communication as Domain of Knowledge

Climate Change Communication is an emergent domain of knowledge in academic research and there have been different trends, challenges and strategies of communication contributing to this field of study. It mainly examines the factors that affect and are affected by the way climate change is communicated, with major reference to public understanding of climate change, through a broad range of philosophical and research traditions. Premium scholarly anthologies like The Oxford Encyclopedia of Climate Change Communication (Nisbet *et al.*, 2018), Handbook of Climate Change Communication (Leal Filho *et al.*, 2017) provide a comprehensive set of topics related to this expansive interdisciplinary field. One comes across a range of approaches adopted to communicate climate change, from risk communication to advocacy journalism, bringing in a different dimension of the great climate challenge. One analysis by Evans, Dyll and Teer-Tomaselli explains that Risk communication is the way government agencies and organizations assess and manage risk and crisis situations, and how they communicate the nature of the crisis to stakeholders and members of the public. Development journalism has perceived to be journalistic evaluation of the variations between planned development and the actual implementation in a long span thus making it stand apart from day-to-day news analysis while advocacy journalism is more about political positioning of the issues with respect to power imbalances in the society (Evans, Dyll and Teer-Tomaselli,2018). With the emergence of SDGs and the eminent context of climate action, Sustainability communication appears in the fold of climate communication, with a solution-centric approach (Weder, Krainer and Karmasin, 2021). Such multidisciplinary understanding of climate change communication appears overwhelming and confusing at times.

2.1.1 Science Communication and beyond

Communication Researcher-practitioner Susanne Moser presents an extensive review of the field through historical development of climate communication from the 1980s till now. She observes that the scholarly contribution to this field has been dominated by the work of scientists communicating about climate change and this sort of communication is not developed from the field of communication studies (Moser, 2010). Another important critique is that theory of climate change communication has evolved within the theoretical

developments in the field of science communication (Nerlich, Koteyko and Brown, 2010). Science communication is based on the information deficit model (Suldovsky, 2017) which assumes that people lack nuanced understanding of the scientific nature of the issue of changing climate, which is attributed to lack of scientific information and therefore more scientific information is transmitted. However, the transmission model of scientific communication has proved inadequate to prompt behavior change and public engagement and communicators in this field need to go beyond and understand the audiences in a wider perspective (Cook and Overpeck, 2019).

Climate communication is believed to be an offshoot of environmental communication for long, which calls for an interdisciplinary debate. The core issues addressed through Environmental communication have a great overlap with climate crisis but climate communication has a differently evolved trajectory (Comfort and Park, 2018). This underscores the salience of an observation that the multiple disciplines, the climate communication has spanned across, have insufficient understanding of each other's research traditions, rendering the field to be geographically biased, theoretically narrow, and methodologically limited. It needs further studies to bridge the disciplinary knowledge divides. (Agin and Karlsson, 2021). In her crucial analysis of the variety of different perspectives and theoretical frameworks present in the field of climate change communication, Ballantyne (2016) concludes that the field is characterized by diverging and incompatible understandings of communication as a theoretical construct that operates in separate ontological and epistemological perspectives. In order to advance a multi-perspective discussion on the role of climate change communication in society, Ballantyne recommends a meta-theoretical conceptualization of communication.

2.1.2 Going from deficit to Dialogue

In the background of future directions suggested by researchers, the bridging metaphor mentioned by Agin and Karlsson appears highly significant, if one considers the shift in approach from 'deficit' to 'dialogue.' Susanna Priest discusses this shift in her book (2016, pp.7-8), where she mentions about the emphasis being placed on creating opportunities for two-way communication and dialogue through improving scientists' engagement with the public and non-scientists engagement with scientists. A shift towards carefully designed public engagement brings into discussion the importance of effective ways of communicating, apart from the usual forms of communication as well as that of identifying the right audience. This calls for a closer look at the research and literature about the visual imagery of climate change.

2.2 Visual Communication of Climate Change

Visual communication takes different forms like videos, still photographs, images like cartoons-memes, data visualization graphs and so forth. This can be far more powerful than textual communication, especially when it comes to behavioral change or identifying a problem. Messaris P and Abraham L (2001, quoted in O'Neill and Smith, 2014) mention that images are analogical, they lack an explicit propositional syntax and they are indexical. These properties make images subject to multiple readings and multiple understandings. With reference to these important communicative properties of images and broadening the use of

Stuart Halls 'Encoding/Decoding Model of Communication' from its original televisual origin to encompass all climate visual mediated interactions, Visual communication researchers Dr. Saffron O'Neill and Nicholas Smith demonstrated that the investigation of climate communication through visual imagery is a multidisciplinary, and often interdisciplinary, research area (O'Neill and Smith, 2014). What images are chosen for communication, what message do they convey, who conveys the message and in what manner are some of the key themes researchers try to address, across different geographies.

2.2.1 Media and Visual Imagery of Climate Change

Mass media has made an extensive use of visuals to communicate about global warming but the use of visual imagery, its impact on the stakeholders and the politics of meaning-making has led to an emerging strand of scholarly investigation.

2.2.2 Climate Visuals and Emotions

The environmental humanities refer to an 'apocalyptic sublime' or 'climate-dystopia' which implies climate change induced collapse of the Anthropocene. The recent critique of the anthropocenic sublime (Fressoz, 2021) explains the limitations of the approach. Fear inducing images of climate change (extreme weather events, large scale destruction, environmental conflicts) have a great potential for attracting public's attention to climate change but in the longer run it becomes counterproductive. However, Fear cannot be an effective tool for enticing genuine personal engagement as it tends to generate non-productive emotional responses like hopelessness and apathy. Research shows that nonthreatening iconography and imagery with links to individuals' everyday life and concerns in the larger context of macro environmental issues like climate change tend to be more engaging. (O'Neill & Nicholson-Cole 2009).

2.2.3 Climate Visuals and the Geographical Context of Images

Another critique of the widely circulated, popular perception of climate imagery is about 'localized images' versus the 'distant images' of climate change. The localized imagery may create a connect with the population but may also get trivialized, losing the appeal for popular action or participation. Distant imagery may invoke fear or great concern in people's mind but may create a kind of geographical helplessness as people may not 'travel' that far to participate in action. The unintended disengagement of people due to local vs distant or global impacts of climate change imagery needs further research, investigation, and careful examination. (Chapman *et al.*, 2016). In her analysis of visual imagery used by media in the UK, US and Australia, O'Neill mentions two dimensions of distance, as geographical distance, and psychological distance (O'Neill, 2013). She further explains that the 'distancing visual frame' like the melting glacier, industrial smokestacks or images of non-human nature does not resonate because the impacts, causes and solutions are not closer to the viewer. Elaborating further on the geographical and psychological appeal of climate images, ace researcher Stephen elaborates recommends to use the climate images that bring relevant information down to the local level, into a community context that people care about, using the climate issues in local landscape Sheppard (2012, pp.49-50) (Sheppard, 2012).

2.2.4 The Perception Problem

Images can easily become the core of climate change communication but often remain overlooked, underutilized, and understudied. Climate Outreach, the UK based leading organization in the domain of 'public engagement and climate change' describes this issue as

an ‘Image problem’ which can be characterized by a restricted set of visual associations in the public mind. (Corner 2018) Climate Outreach continues to explain that, ‘the images people associate with climate change tend to be abstract and psychologically distant, devoid of specific geographic, social or temporal details and typically do not feature people.’ Imagery can give more power and meaningful interpretation to complex concepts like climate change because images can create a common understanding of the issues represented by them. Climate Outreach, has launched a special platform like ‘Climate Visuals’ with the conviction that in order to build public engagement with the help of images, climate change communication needs to focus around photographic portrays of human stories rather than focusing on abstract imagery of science or politics. It also suggests that the communication needs to be contextualized in a local sense though it has its own set of challenges like ‘trivializing the greater problem’ (Corner 2018). At this juncture, it is important to understand the challenges ahead of public perception research that focuses on facilitating effective communication for better public engagement.

2.2.5 Solution Journalism and Adaptation Communication

In order to further the engagement of people, the solution-oriented imagery has a great role to play. A mixed methods investigation of public perception of climate images (Chapman et al 2016) shows that images of solutions produce positive affective responses and less polarization. The catch is that as the images of climate solutions elevate the self-efficacy and tend to make people feel more able to do something about climate change, it may at the same time reduce people’s sense that the issue is an important issue demanding participation.

At the same time, Chapmans research findings bring to the fore the salience of ‘Solution Journalism’ and ‘Adaptation Communication’ that is taking roots in recent years. Simply put, Solution Journalism focuses on how people are trying to solve problems and what can be learnt from their successes and failures. Adaptation Communication talks about how individuals, communities, cities, and regions are perceiving-experiencing climate change impacts and in response to that accepting the challenge of changing incrementally (Chapman et al 2016).

2.2.6 Challenges Pertaining to the Audience and the Platform

Every strand of climate change communication has a target audience in mind but the geographical diversity and socio-cultural character of the audience is a determining factor in the communication process. Agin and Karlsson (2021) draw attention to a pertinent fact that in the field of environmental and climate communication the research on the west conducted by the west is dominant. This leads to a self-perpetuating spiral in research and literature where a particular region is studied and cited again and again inspiring more research, more citations in the area with less need to use studies from other regions or countries as references. This tends to affect countries in the developing south which are the countries worst hit by climate change and struggle the most with adaptation.

When it comes to research about media engagement with climate change communication, most of the research is focused around print media or mass media, whereas the social media takes a backseat. Schafer (2012) brings forth some crucial observations. While Scientists, Politicians and Scientific institutions play a limited or negligible role in online climate communication, NGOs are the champions of online climate communication. The amount of online climate content is significant and increasing but the quality of science communication online is considered poor. Studies on the effects of online communication on politicians and

policymakers are rare and demand further research. Given that almost a decade has passed since Schafer made his observations and the post-pandemic times have defined a new era of online communication, researchers have a lot more to explore about the online platforms and climate change communication.

2.3 Knowledge Gaps and Contribution of proposed research

This literature review has helped us recognize major gaps in existing discourse on climate change communication and identify the specific requirements for communicating climate change induced Urban Stresses and vulnerabilities as follows.

The Climate change communication literature does not have a distinct focus on urban climate change. Visual communication of urban heat stress is largely absent.

The proposed research is going to take a field-based approach to create the urban centric climate visuals, exploring the potential of documentary photography. The scholarly inquiry would contribute to the body of knowledge on visual communication from a different, practice-based approach. This work will find great practical implications, with a major contribution to advancing the visual communication of climate stress at the local scale.

The following chapter elaborates the methodological framework.

CHAPTER 3: METHODOLOGY

This chapter is important to understand how the research objectives are met, especially how the photography based visual narratives of urban heat Stress in Germany have been created and how the response of key-stakeholders to these photographs have been carefully sought. The theoretical underpinning of my research lies at the confluence of visual ethnography and Framing analysis, elaborated in the following sections.

3.1 Stepping into the Visual Research

The research aspires to understand the role of photographic images in communicating urban climate risks and vulnerabilities, particularly urban heat Stress, in day-to-day life. It also involves photographic documentation of urban heat Stress in Germany, to develop into a visual repository. Given the nature of research, this scholarly inquiry draws inspiration from a detail-oriented qualitative methodology like ethnography, mainly from the perspective of Visual Ethnography. Defining ethnography has been an elusive and complicated question (Hymes, 1978), but it is widely acknowledged that ethnography aims at documenting what goes on, in naturally occurring settings, relying on participation observation and personal engagement (Hammersley, 2018).

Visual ethnography is often considered to be an extension of ethnography, having grown from disciplines like visual anthropology and visual sociology but today, it is not only restricted to these disciplines. The contribution of visually oriented ethnographic approach is increasingly recognized in disciplines like Geography and interdisciplinary research fields like educational studies and media studies (Pink, 2020, pp.2). The theoretical underpinnings of virtual ethnography are dynamically evolving and context-specific, rather than emanating from a single theory or a particular discipline. The conservative understanding of visual ethnography upholds the view that visual ethnography is a means to incorporate a visual dimension into an already established methodology based on a scientific approach to sociology (Grady 1996, Prosser 1996, Prosser, and Schwartz 1998, quoted in Pink, 2020, p.10). However, the later developments have emphasized on rejecting the superiority of written word over images and incorporating visual images, objects, or descriptions whenever when it is appropriate, opportune, or enlightening. (Pink, 2020, pp.10-12).

Visual ethnographer Sarah Pink interprets that visual ethnography does not claim to produce an objective or truthful account of reality but should aim to offer versions of ethnographers' experiences of reality that are as loyal as possible to the context, the embodied, sensory, and affective experiences, and the negotiations and intersubjectivity through which the knowledge was produced (Pink, 2020, p.35). The practice based visual ethnography in the digital age of the 21st century can be comfortably situated into phenomenological anthropology, spatial theory in geography and to certain extent, theories of practice (Pink 2009, Pink 2012, Pink 2020). Since a large part of my research is related to understanding how people experience, negotiate and deal with climate change induced urban heat Stress, Visual Ethnography situated

in phenomenological anthropology provides one of the theoretical frameworks to my research work.

Visual Ethnography involves an extensive usage of producing images and photography has always been a crucial element of the ethnographic research methods. Photographs are sought to elicit response from the participants and hence, the elements of the photograph or the overall process of image-making matters to a great extent. This brings us to another theoretical paradigm of this research- the framing theory and framing analysis- that has larger implications on the research objective of creating a visual repository of urban heat Stress.

3.2 What is Framing and Why does it matter?

A question raised by Collier -Can photography be a source of direct research in anthropology- led to a systematic scholarly investigation into properties and methods by which photography could support social science research (Collier, 1957). Today, we have an array of highly sophisticated photographic inquiry methods including photo-elicitation, where photographs are used to elicit response from participants. Harper illustrates that ethnographic investigation assumes active looking, most obviously demonstrated in self-conscious decisions about framing (Harper, 2003), that can be used to call attention to certain ideas.

Framing is an important concept and area of research spanning across many disciplines of social sciences. In its most general sense, Framing refers to ‘’communicative process of sense-making in which some aspects of reality are emphasized and others are de-emphasized’’ (Schäfer and O'Neill,2017). Frame analysis critically investigates the selection and salience of aspects of an issue by analyzing components like images, stereotypes, metaphors, actors, and messages (Matthes, 2009). There is a diverse range of theoretical and operational understandings of frames. Frame analysis is still neither a full-fledged theoretical paradigm nor a coherent methodological approach (Potthoff, 2012 as quoted in, Schäfer and O’Neill, 2017). However, Framing has a significant potential of sense-making and it has developed into one of the most promising concepts in the field of media and communication sciences (Matthes, 2009). Nisbet (2010) explains that Frames are interpretive storylines that set a specific train of thought in motion, communicating why an issue might be a problem, who or what might be responsible for it and what should be done about it.

The scholarly research in Framing focuses primarily on text-based communication and there is not enough attention to the visual and multimodal framing, except some exemplary analytical frameworks. Rodriguez and Dimitrova (2011) have developed a four-tiered model of identifying and analyzing visual frames that applies to any type of visual media content or audiences’ perception of that content. This model helps one gain a sound understanding about levels of visual framing and I have referred to this model, while analyzing the photographs I have captured.

When it comes to fulfilling the second and third objective of the research, Visual Ethnography and Frame-building rooted in Framing Analysis inspire the methods selected for capturing photographs as visual frames while Photo-elicitation addresses the effective engagements with key stakeholders.

Visual Ethnography is not a linear process and involves a combination of methods to reach results and analysis. A schematic diagram depicting the flow from methods to results, helps explain the methods used at various stages of research. An in-depth description follows in the next section.

3.3 Methodology Flowchart

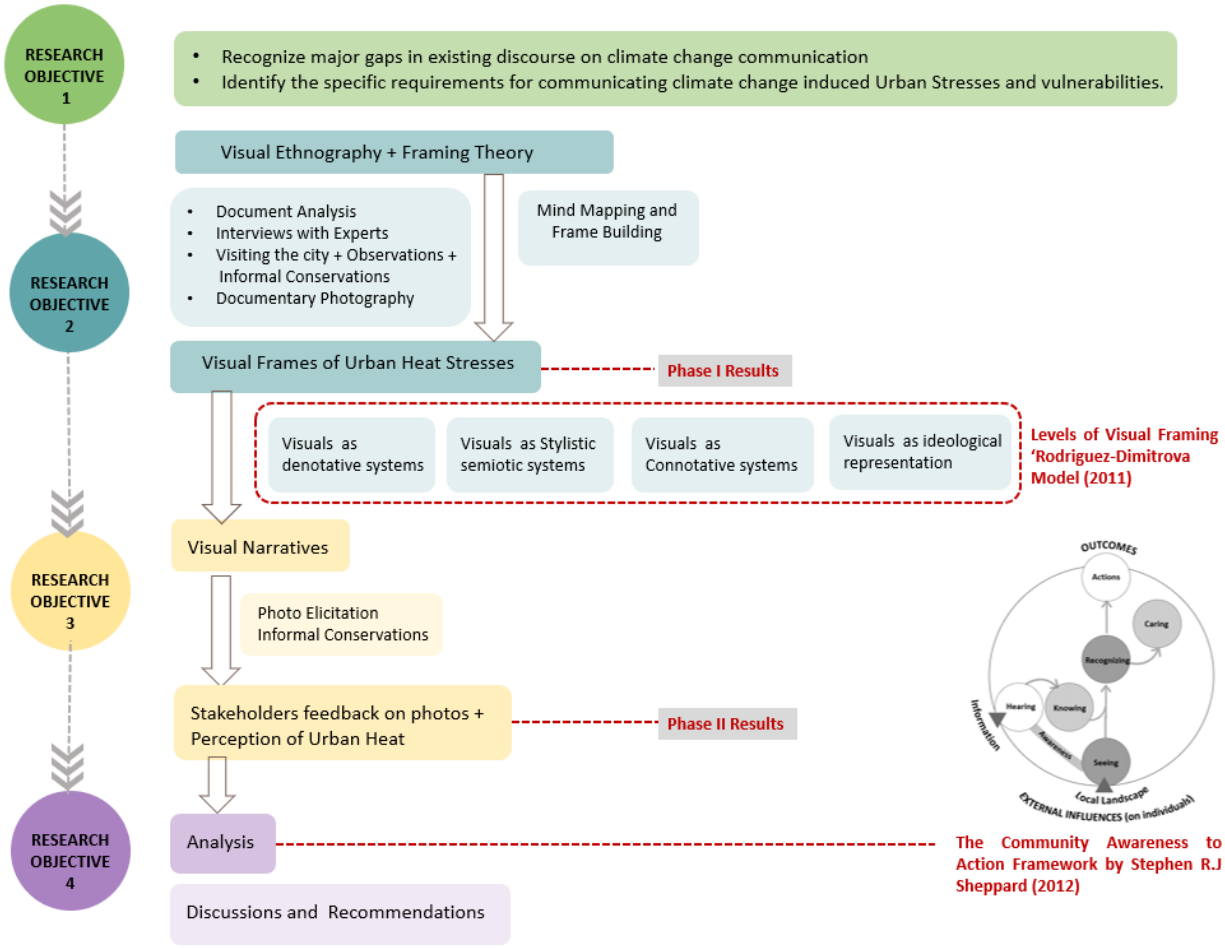


Figure 1 - Schematic Diagram depicting flow from methods to results

3.4 Planning Visual Research

Visual Research is a long, evolving, and dynamic process that needs meticulous planning that spans across weeks, often months. The very heart of visual research is Ethnographic fieldwork which is a unique and personal experience. Visual ethnography has a set of methods available to all the ethnographers but the context of the research and different circumstances demand using either a combination of methods or innovative use of methods, to produce knowledge. The selection of methods depends on several factors like the field-location, the profile of participants, the visual treatment and in this research, even the climatic conditions and weather patterns. In this backdrop, planning visual research is very crucial. While planning the ethnographic fieldwork, based on document review I considered the following factors that shaped my approach and choice of methods.

3.4.1 Field Location or Selecting the Cities for Visual Documentation

Germany faces severe climate challenges like floods and heat waves. A major scientific study about the heat related mortality in Germany for the past three decades (Winklmayr *et al.*, 2022) shows that higher temperature regularly leads to increased mortality, particularly among the elderly and heat events are a significant threat to human health. The observation has been corroborated by another study on climate change, heat waves and heat waves associated with IHD mortality in Germany (Zacharias, Koppe and Mücke, 2015). This led me to search more about urban heat Stress as a major challenge in Germany. A quick scan of National Climate Reports and Weather Warning Reports published by Deutscher Wetterdienst (DWD) or the German Weather Service and Newspaper articles helped me understand that South Western Germany has more pronounced heat Stress compared to the rest of the country. I learnt about the 'Upper Rhine Valley' cities of South West Germany that are the warmest in the country. The stretch of cities starting with Freiburg am Bissau extending northwards till Frankfurt are prone to warmer summers because of their geographical location, was an important insight for me.

DWD Report on Climate Projection Studies in Frankfurt (Früh, Koßmann and Roos, 2011) gave a nuanced understanding about the enhanced UHI effect and increasing air temperatures in Frankfurt. In the backdrop of building construction and densification of built-up spaces in Frankfurt, the study projected a steady rise in the number of summer days (days with a maximum air temperature of 25 °C or higher), summer evening (evenings when the temperature at still exceeds 20 °C at 10 p.m), hot days (with maximum temperatures at 30°C or more) and tropical nights (with minimum temperatures not below 20°C) by the middle of the century. The report also highlighted the dynamics between high-rise buildings in the financial district of Frankfurt and a very high nocturnal heat island intensity. This analysis helped me choose Frankfurt as my main field-work location.

A comprehensive analysis of urban climate studies in German cities (Fuchs,2019) led to an understanding about urban heat Stress in terms of the number of summer days, hot days, and tropical nights in these cities. The same research presented that the development alone in the city centers of Stuttgart, Mainz and Wiesbaden led to an increase of around 20 summer days, 10 hot days and up to 15 tropical nights per year, which helped me focus more on city-centres and around. A research paper about subjective heat Stress in everyday life of urban citizens of Karlsruhe (Kunz-Plapp, Hackenbruch and Schipper, 2016) gave me a different perspective to look at the daily life of people and imagine the vulnerabilities. In this backdrop, I decided to visit Stuttgart and nearby towns for a short period, to enhance the rigour of my fieldwork.

3.4.2 The Opportune Time-frame for Visual Documentation

Once the location was decided, the major challenge was to decide the exact time to visit the cities. I decided to spend more time in Frankfurt, develop ground understanding about field work and then use the same in Stuttgart at a later stage. I relied on weather reports and weather projections by DWD and by web-portals like accuweather. A daily assessment of the weather forecast in Frankfurt and Stuttgart led to the decision that the months of June and July would offer maximum heat Stress in these cities.

A decision on location and time-frame led to a two-fold analysis. On a very broad scale it involved understanding the perception of key stakeholders like journalists, media researchers, academics etc. on urban heat Stress, the vulnerabilities it leads to and their views on visual communication of heat Stress. On a narrow scale, it involved understanding the city-scape of Frankfurt and Stuttgart in terms of the social, economic, and cultural fabrics of the city, in order to choose neighbourhoods for photography. This point onwards a combination of Interactions with Experts, Informal Conversations with people associated with these cities (for example tapping social networks of friends, colleagues or their friends living-studying-working in Frankfurt and Stuttgart), YouTube videos, podcasts, films about the cities helped me prepare the ground for my field-visit.

3.4.3 Interaction with Experts

Climate change communication involves key actors like media and journalists, political leadership, urban practitioners, academia among many other stakeholders. These major actors work on or influence the messages to be delivered to a wider population. I decided to interact with some representative stakeholders to develop a broad understanding about urban heat Stress, vulnerabilities, and visual communication in general and the repercussions of the same factors in German cities. While selecting the Experts, I relied on factors like their significant contribution to or influence over policy, practice, and groundwork as well as innovative approach in the domain of heat Stress or vulnerability or communication of climate change. From Europe's first ever Chief Heat Officer to academician-practitioners in Climate Journalism Network, I interacted with a wide range of highly influential stakeholders that helped me develop major insights for photographic work and proceed with visual documentation. The following table encapsulates the summary of interviews.

No.	Field of Expertise	Name , Designation and Work	Major Takeaways of Interaction	Key insight for Photographic Work
1	**Climate Resilience and Sustainability Leadership, Heat Resilience, Climate Action**	**Dr.Eleni Myrivilli** Global Chief Heat Officer -UN Habitat, Europe's First Chief Heat Officer, known for Heat Resilience Interventions in Athens, Greece.	1)Heat is a Silent Killer and a Major Challenge for European Cities 2) We need to identify different layers of Vulnerability to Urban Heat. Groups like Pregnant/Neonatal Women, Kids, Labourers, Farm Workers and Homeless are most vulnerable. 3) Visuals can play a significant role in creating awareness about Heat stresses.	The interaction helped me search for frames specific to women, kids elderly people and labourers, suffering from heat stresses
2	**Media and Communications**	**Dr.Alexandra Borchardt** Media Advisor – Hamburg Media School, Communication Researcher	1)In Germany, General Level of Awareness about Urban Heat Stresses is low 2) In media reports there is no reliance on specific images of urban heat stresses. Rather stock images are preferred 3) Critical mapping of Vulnerabilities arising out of stresses may lead to effective communication designs and better awareness	Inspired a deeper visual analysis of photos used by print and electronic media and understand what could be made differently, to express UHI.
3	**Climate Communication**	**Dr.Christel Van Eck** Climate Communication Researcher, Amsterdam School of Communication Research	1)UHI and Urban Heat Stresses are not known among the audiences 2) A Public Health lens need to be used to communicate about Heat Stresses.	I started thinking more about the moments that express impact of heat on human body.
4	**Climate Journalism**	**Luke Bayer** Network Climate Journalism, Austria	1)Heat is a silent killer and even more dangerous for people with psychological illness or physical disabilities. 2) Relationship between spatial-temporal dimension of urban heat stresses and vulnerability provide crucial connections.	Who suffers from the heat stresses in which part of the city at what time may give better idea about vulnerability. It helped me think about photo-walks on streets with homeless population.
5	**NGO Sector , Journalism and Communication**	**Toralf Staud** Author(Germany 2050-How Climate Change will change our lives), Journalist and Editor – Klimafakten.de	1)In Germany, media reports of heat stress are dominated by reporting of Heat Waves but urban local stresses are not actively reported. 2)The Pleasure-pictures of heat stresses are misleading. 3)We need to sensitize a niche audience like weather reporters, Architects and Doctors about local heat stresses in Cities. 4) We need better and more appropriate visuals for generating mass awareness.	Rather than shaping my visual frames, this interaction helped me analyse my photographs from the perspective of niche audience and develop visual narratives.
6	**Academia, Environmental Journalism and Education**	**Dr.Torsten Schaefer** Network Climate Journalism Germany, Author and Educator, HTW Darmstadt	1)Visual Communication can be effective if Urban Heat Visuals are made more local and more human centric 2)We need more constructive and solution-oriented visuals, drawn from Micro-localities.	The interaction inspired me to photograph the human stories of urban heat in micro-localities like specific neighbourhoods, markets, gardens or streets.

Table 1 Summary of Interaction with Experts and Key Insights for Photographic work

3.4.4 City-Visits, Observation, and Informal Conversations

I visited Frankfurt between 11 June to 18 June and Stuttgart-Ulm-Munich between 7 July -10 July, when the maximum temperatures were at 30°C or more. Before taking my first picture in Frankfurt, I collected more local data through informal conversations and observations.

Figure 2: A visual summary of Field Locations and Field-visits in Germany

Informal Conversations

Conversations with fellow-travellers at the railway stations, at bus-stops during the journey in trams, offered rich insights about the socio-cultural profile of the city, its neighbourhoods, and special features. Depending on the situation, the person I am interacting with and the context of the conversation, I skilfully used some of the following questions to gather more information-

- Hey Hi, the day has been very warm for me. What do you think? How do you feel? / Hello, is today a warm day for you? /
- Where are you from? Where are you travelling to? Is your city/neighbourhood equally warm these days? Where in your city do you feel very warm and at what time of the day?
- Has it always been warm or is it getting warmer in recent years? Has this been a 'summer as usual' for you?
- Do you feel stressed out because of the heat? Do you feel more thirsty or dizzy or do you get sun-burns?
- How do you beat the heat? Do you choose any diet or drink or place to chill out at?

- When it is a warmer day than usual, how do you prepare yourself? Do you stay at home or if you must step-out, what time of the day you choose?

Good hearty interactions on these lines provided rich insights into the neighbourhoods of Frankfurt, Stuttgart, and Ulm where I could 'experience' the heat or could 'see' how people are negotiating with heat. I shortlisted such neighbourhoods and made multiple visits, conducted observatory walks on different times of the day to observe the human-interactions closely and understand their response to heat Stress. This repetitive exercise, also a method in visual ethnography, helped me identify the micro-localities for photo-documentation. This is explained in the following schema developed at Frankfurt.

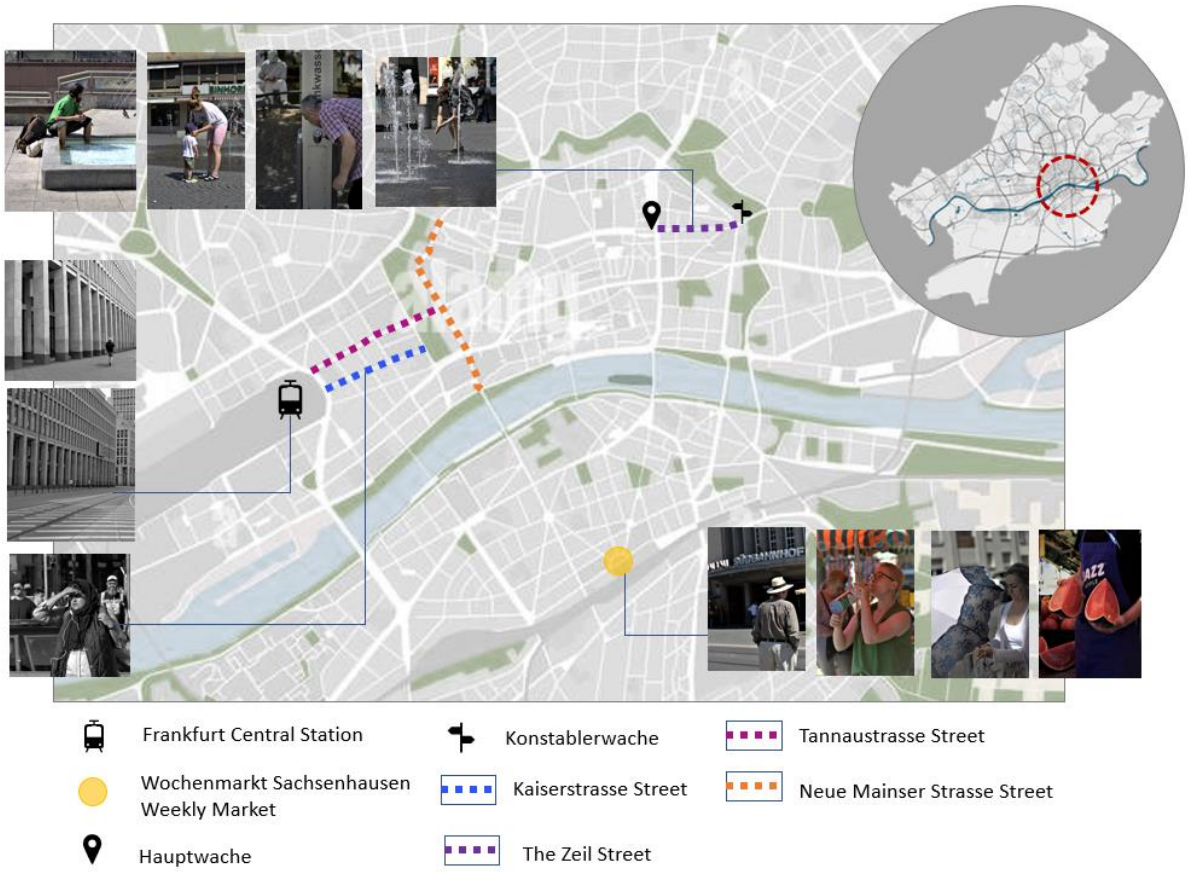


Figure 3: Identifying Microlocalities for Photo Documentation in Frankfurt

- Wochenmarkts

In one of the conversations, someone told me about the 'Weekly Markets' in different parts of Frankfurt, where the organic agro-produce is sold in the open. These markets are transient city spaces, mostly the streets, public squares, garden corners that are transformed into an open-air market space on week-days or on weekends, where people from the neighbourhood, labourers, delivery drivers come together for transactive activities. The marketplaces are also a point of social gathering where elderly people from the neighbourhood come together for a beer or a 'kaffee und kuchen' meet. Given the number of social interactions occurring at a transient space, 'Wochenmarkts' became excellent micro-localities for me to observe and photo-document the impact of heat on people. In Frankfurt, I visited various wochenmarkts and the one shown above is the Wochenmarkt at Sachsenhausen neighbourhood.

- Transport Facilities and Pedestrian Zones

Many people shared that they experience heat-stress while using public transport. Tram stops, Bus stops and S-Bahn stations become the nodes where people take short-halts for changing the mode of transport. These places are generally closer to the pedestrian zones, often frequented by the tourists or the floating-population of the city. These spaces are buzzing with human activities and experience heat Stress. In Frankfurt, what became my microlocality was a section of the pedestrian street - 'The Zeil'- stretched between two major public squares, the Hauptwache and Konstablerwache.

- Water Fountains and Drinking Water taps

More than a microlocality, the water fountain came across as a visual pointer or a theme, emerging from observatory walks. On a scorching hot day, I observed that people were gathering at water-fountains to refill the water bottles. Splashing water on the face or on the head, holding hands under the tap or soaking feet in the water fountain revealed so many details, rather personal strategies of beating the heat or of seeking some relief.

Similar process was followed to identify micro-localities in Stuttgart and Ulm, as shown below.

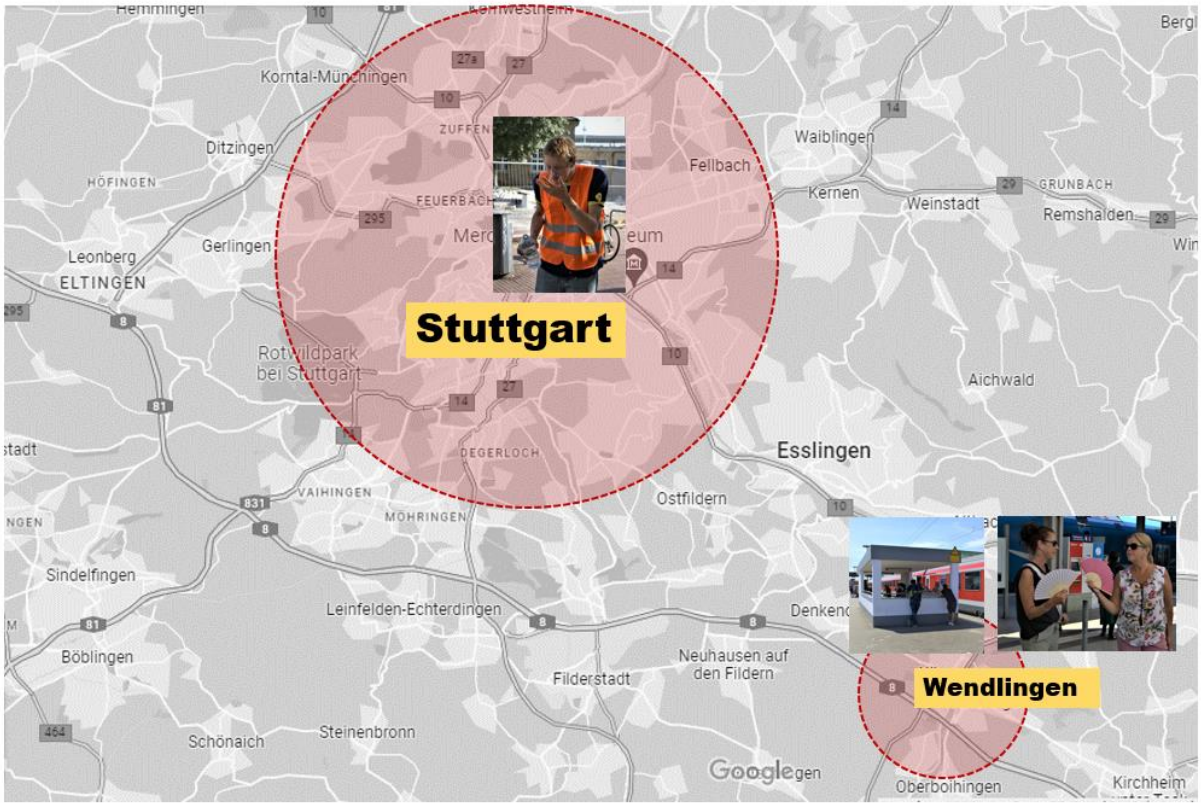


Figure 4: Microlocalities in Stuttgart

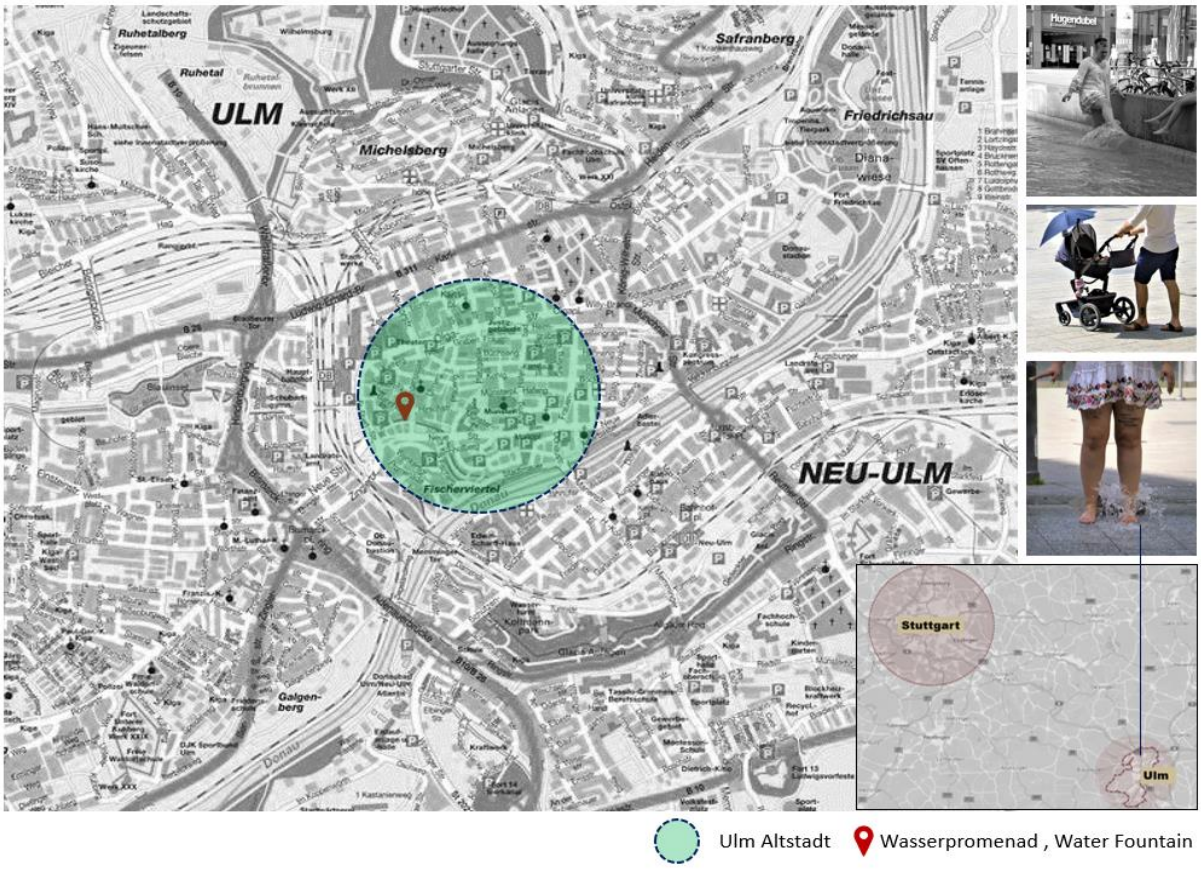


Figure 5: Microlocalities in Ulm

These observations and insights contributed towards photo-documentation of urban heat Stress, through richly built visual frames.

3.5 Documentary Photography

This research uses documentary photography style to capture the perceived impact of heat Stress on people, across different locations. Along with an extensive pre-photography preparation as discussed above, I focused more on Frame-building or composing the picture through different elements that indicate or give a sense of heat. The visual frames form the core of the visual repository envisaged in research objective 2 and can be considered as 'Phase 1 Results', which needs further analysis.

3.6 Developing Visual Narratives to seek Stakeholders Feedback

Visual narratives are essentially the reorganized presentation of visual frames or as goes in this research, the photographs with some additional layer of text added to them. Visual narratives are presented in a very context specific manner.

Using the four tiers, 'Levels of Visual Framing' model given by Rodriguez-Dimitrova (2011) I interpreted visual frames, reorganised them in visual narratives and presented them to people through photo-elicitation workshops and informal photo elicitation conversations.

3.6.1 Photo elicitation

Photo-elicitation is an effective way of using photographs to interview people, to bring out the deeper, richer insights. The method was established in the work of John Collier Jnr. Ace visual ethnographer Douglas Harper made an extensive use of photo-elicitation interviews in his work. Harper illustrated that the human mind responds to two forms of symbolic representation in differ ways, because images invoke deeper elements of human consciousness than the words alone do. Given this, photo elicitation interviews not only elicit more information but different information (Harper, 2002). The word elicitation may suggest extracting information from the participant but Sarah Pink (2020, pp 92-93) goes beyond the process and looks at the photo-interviews as an activity "informed by the ideas of inviting, co-creating and, making knowledge with photographs rather than the notion of eliciting knowledge from respondents through them."

This broader understanding of photo-elicitation is more conducive for this research because it seeks to elicit interpretation of visual frames from key stakeholders like urban practitioners, political leaders, journalists etc who have a certain perspective or at the least, awareness of the larger climate change issues.

I conducted one full-fledged photo-elicitation workshop with the members of Green Party, Dresden Unit. I conducted informal photo-elicitation conversations with several urban-practitioners like Urban Planners, Environmental Engineers, Urban Designers and Landscape Architects in Dresden.

3.6.2 Field-based Improvisation: Photo-Exhibition and Photo-Display

While I was coordinating for photo-elicitation session with the members of Green Party, two opportunities came my way unexpectedly. First was a chance to display my photographs at a workshop themed around 'Urban Climate Change and Nature Based Solutions' and second was an invite to organise a full-fledged photo-exhibition of Urban Heat Visuals in the Green Party Office at Dresden. This was never a prescribed method in my research design but it aligned with my methodology very well.

I decided to go ahead with Photo-exhibition and display, observe the visitors and engage with them informally to develop more understanding about how the general public makes sense of the visuals. I describe this exercise as a field-based improvisation that offered rich insights into understanding the way viewers construct knowledge while interpreting the visuals. The method helped me learn more about the perceptions of the viewers and audience frames.

The key takeaways of the Photo-elicitation Session, Photo-exhibition and Photo-display were considered as 'Phase II Results.'

A comprehensive, holistic analysis of results from Phase I and Phase II led to developing recommendations for effective visual communication of urban heat Stress. The results are presented in the following chapter.

CHAPTER 4: RESULTS AND ANALYSIS

This chapter presents the results of photographic documentation of urban heat stress in Frankfurt, Stuttgart, and other cities. It also puts forward the viewer's response to this photographic work in a later phase. The chapter follows a certain pattern of result and analysis followed by another set of results and analysis.

4.1 Phase I Results: Visual Frames of Urban Heat Stress

The first set of results is a collection of photographic visuals, more specifically visual frames, depicting different situations. Presented below is a representative sample from a collection of 50 visual frames covering different dimensions of urban heat stress. Some reflection right at the beginning, on how the particular visual was created or how the 'photo-moment' was captured would give out more insights about the whole documentation experience.

Photo 1: Worker splashing water on face

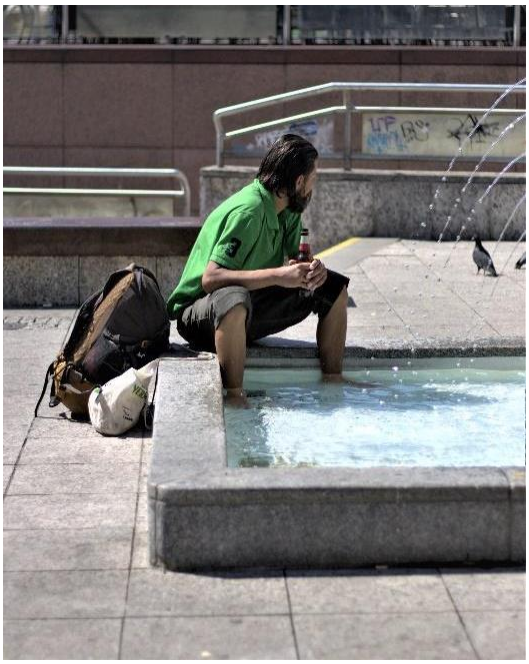


Photo 2: Homeless in Frankfurt, soaking his feet in water

The first visual depicts a worker splashing water on his face. What is most eye-catching is the bright safety jacket he is wearing, his sleeve curled up, the water-bottle in his hand and the splash of cold water going up. The young man in the foreground is centrally placed in the frame while the background is bright, with a lot of sunlight and a sense of an unkempt street, probably the work site. These elements when put together connotatively convey presence of heat because, the way water is used to cool off, implies heat stress. The photo-moment was conceived because of two factors. While young people are not generally considered vulnerable to heat stress, the young man was using purchased water to cool off, while still in his safety jacket. That was the trigger for me to capture the moment.

Photo 3: Siblings with hand-fan, in train

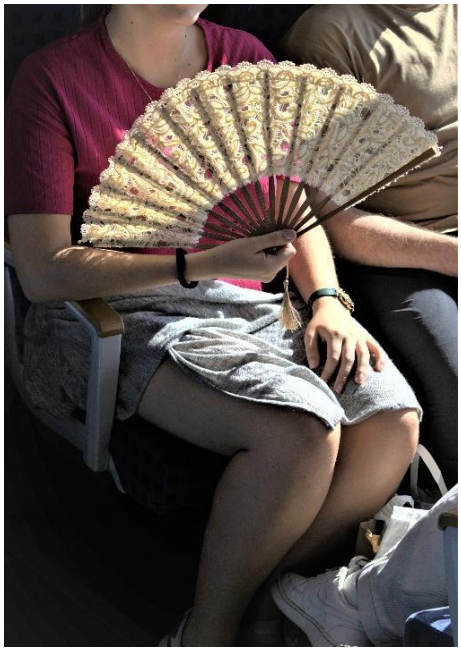


Photo 4: Women with folding fan, in train

Photo 3 shows two siblings travelling by train. The brother is seated beside the window, where sunlight falls while the young girl sits along the aisle, holding a hand-fan. She is in the foreground and right at the centre of the frame. I was observing these kids. The moment the girl saw sunlight falling on the seat, she took her hand-fan out. Carrying the hand-fan during the train journey implies a 'sense of heat' in the subconscious of the young girl and her action of taking out the hand-fan, the moment she saw sunlight reveals her idea of heat. This action-sequence in a flash of time strongly prompted me to click the picture.

Similar action-sequence was found in Photo 4, that depicts the girl coping with heat. She had a more elaborate response. When direct sunlight started falling on her in the heavily crowded train, first she covered her body exposed to the sunlight and then took her folding-fan out. In these images, the folding-fan or hand-fan became the trigger points for the photo-moment. I have discussed more such trigger points in the following section.

There were numerous such moments or 'confluence of thoughts' that led to clicking the pictures. Some of the moments are discussed in further sections. The confluence emerged due to the subconscious thoughts or mind-frames getting blended with the ever-going practice of observing people, mentally taking a note of their body language, reactions, the surroundings and the sensory experience of heat around us. The field-visits were made on warmer days, when the temperatures were high and I believe, that pronounced experience of heat through sensory perceptions. Visuals below help us understand this point better.

Photo 5: Seeking Shade in Public Square

Photo 6: Mother making her child wear a cap

Photo 7: Soaking the feet, at fountain jet

Photo 8: Umbrella and seeking active protection

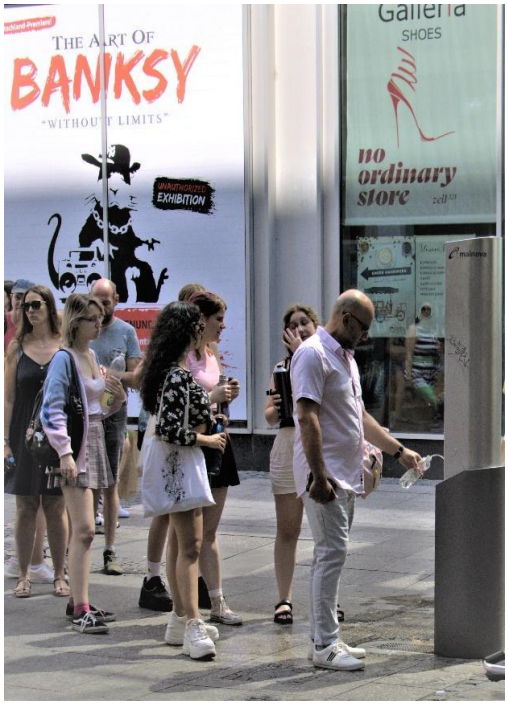


Photo 9: Queuing Up at Public Water Stand

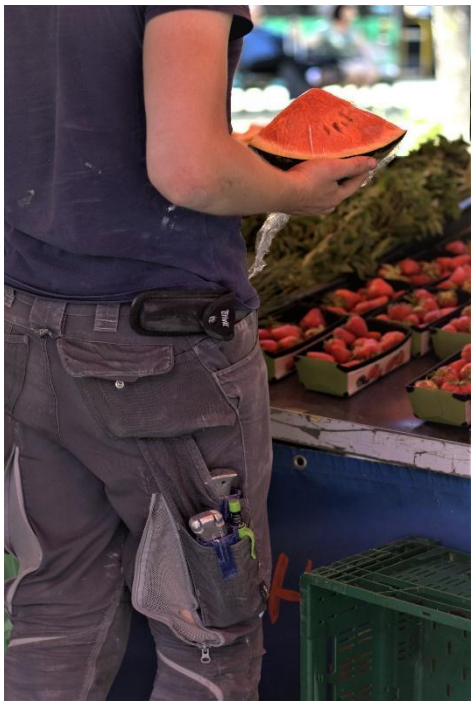


Photo 10: A worker buying Watermelon

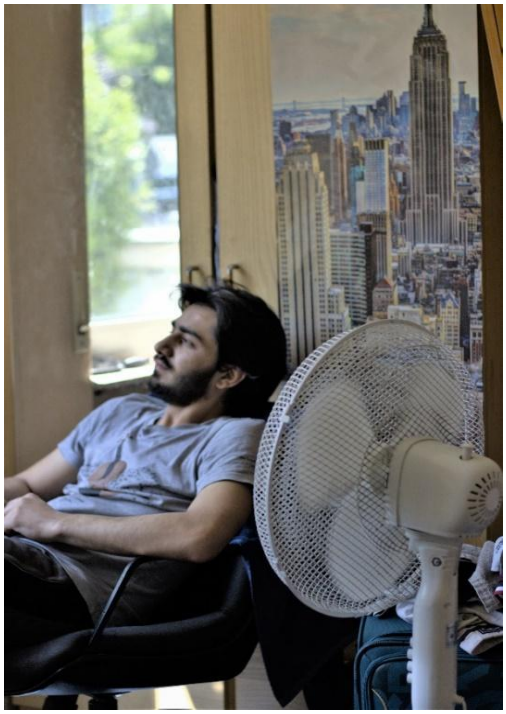


Photo 11: Resting in the room

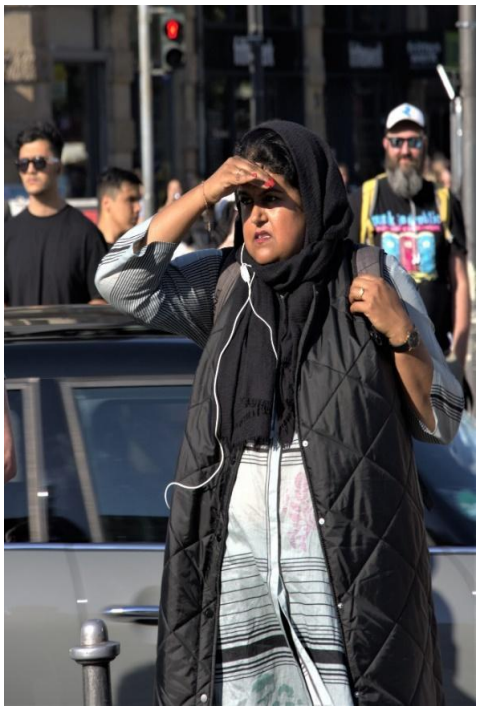


Photo 12: Shielding her eyes

Photo 13: A family at the water-place

Photo 14: Umbrella over the pram

Photo 15: Air Conditioners

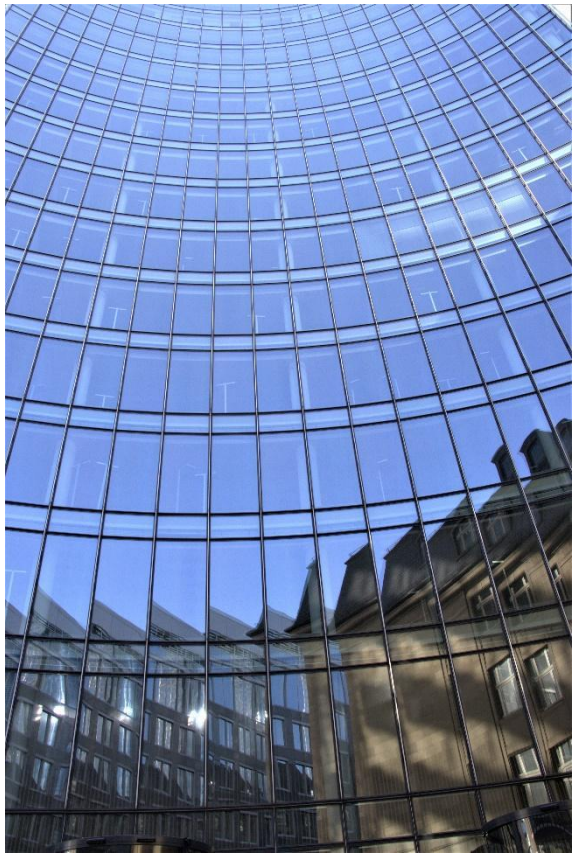


Photo 16: Glass Facades

The composition of these visual frames implies the heat stress. However, further visual analysis of these frames using the four tiered 'Levels of Visual Framing' model helps develop nuanced interpretation and arrange these frames in virtual narratives

4.2 The Importance of Visual Frames and Levels of Visual Framing

Goffman (1974) postulated that the way messages are organized, the way context is presented creates an impression on the way audiences think about those messages, make sense of them or take further action. This presentation of the context and organization of messages is at the heart of framing. Entman (1993) took the idea forward and elaborated that frames can promote a particular problem definition and can explain the causal interpretation.

The framing studies have focused extensively on textual frames but the way issues are framed through images that stand alone or with text has not received adequate attention (Bell,2001 cited in Rodriguez and Dimitrova, 2016). This also holds true about the visual frames used in climate change communication and subsequent visual analysis (Schäfer and O'Neill,2017).

Visual frames have a great potential to frame the urgent issues in the discourse of climate change. Rodriguez and Dimitrova (2016) set out that, ''visuals help render a large amount of detail into practical frameworks that are relevant and appropriate to people's understanding of the everyday world. In this sense, visuals channel discursive possibilities for making sense of social phenomena, they legitimize (and thus facilitate) the grounds upon which some interpretations can be favoured and others impeded.'' In order to bring more clarity on how to identify visual frames, how to analyze the assigned meanings to visual depictions Rodriguez and Dimitrova (2016) proposed four levels of visual framing, that help in visual analysis and meaning-making. This framework is instrumental in analyzing the visual frames of urban heat stress in this research. The main features of the framework are summed up below:

Level 1: Visuals as Denotative Systems

At this basic level images rely on denotation, which is a concept by Barthes (1973) that refers to literal or explicit interpretation of the image. In other words, this level answers who or what is being depicted in the image. Rodriguez and Dimitrova (2016) further explain that the denotative or representational meanings of the frame are established by the titles, captions, inscriptions, or other textual descriptions that accompany the visual. This approach also 'capitalizes' on the application of the gestalt principles of proximity, similarity, closure, and equilibrium that help the viewer organize individual elements of the image, to make a coherent interpretation of the whole (Kearsley, 1998 cited in Rodriguez and Dimitrova, 2016).

Level 2: Visuals as Stylistic-Semiotic Systems

This level investigates the stylistic conventions and technical transformations involved in the image. Stylistic convention refers to the standard conventions associated with the camera-gaze. For example, close-up shots signify intimacy and long shot signifies public distance. These factors along with elements like the colour of the image, depth of field, shades of light define a style of photograph and impart different layers of meanings to the image.

Another crucial factor is the subject behavior depicted in frames. In a non-technical sense, subjects are the human figures appearing in the image and the way they look into camera, the poses and expressions they give help establish their relationship with the viewer, which helps the viewer in meaning-making.

This level delves into such stylistic and semiotic aspects of the visual.

Level 3: Visuals as Connotative Systems

Generally, the persons or objects in the visual denote a particular place, thing or an individual, which can be understood using the basic denotation, as explained in previous levels. The third level of visual framing is highly content-driven and crucial because it addresses the latent meanings, cultural expressions, ideas and concepts woven in the visual, with the help of signs and their relationships with other signs. Rodriguez and Dimitrova (2016) explain that frames in this level are identified by analyzing the presence of symbols in the pictorial fields. Visual metaphors, that are generally used to represent an abstract concept through a concrete image bearing some analogy to the concept, also fall under this level (Lule 2003, cited in Rodriguez and Dimitrova, 2016).

Level 4: Visuals as Ideological Representations

The last level of visual framing gives a broader and coherent interpretation of a visual, in terms of its underlying principles. Pieterse (1992, p.10 cited in Rodriguez and Dimitrova, 2016) explains that the visual interpretation at this level helps one understand the larger interests being served or the ideas that dominate by these representations. It puts forth the many nuances in the phenomenon of subordination.

When these four framing levels are applied to analyze the images one can get a coherent and multi-layered understanding of the visual frames. I used these framing levels- not necessarily in the same order they are presented- to analyze the visual frames captured so far and developed a coherent categorization of the visuals. The major takeaways of the analysis are as follows

- The visual frames of urban heat stress can be best interpreted using the third level of framing, 'Visuals as connotative systems.' Heat is intangible, one can not see the heat but can only experience it. How an individual senses the heat can best be understood by the objects used to negotiate with the heat and in that process, the objects assume an indicator role, just like a symbol. When a woman travelling in the train flashes out a hand-fan (Photo 4) or when kids carry a portable handheld electric fan (Photo 3) it indicates the unusually higher temperatures and presence of unbearable heat. The presence of a fan in the pictorial field becomes the symbol of heat stress.

  Another example of such symbolization is the presence of water as coolant, as an instant relief and as protection. A worker splashing water on his face (Photo 1) or a tired, distraught man soaking his feet in a water fountain (Photo 2) or people queuing up at the water-stand (Photo 9) imply the relief water brings to them, when they are stressed out because of the heat. The numerous ways water is used to negotiate with the heat, assigns a context-specific and symbolic meaning to water, which indicates presence of heat.

  The way this level addresses the abstract ideas through visual metaphors helps visually establish concepts like 'Urban Heat Island' effect, which is otherwise difficult to capture in photographs. Glass Facades (Photo 16) or concrete structures with installed Air Conditioners (Photo 15) can become visual metaphors for Urban Heat Island effect.

- The second level of framing- 'Visuals as Stylistic-Semiotic Systems'- talks about subject behaviour, which implies that the human actions and poses in the frame facilitate the interaction between the viewer and people shown in the images. The 'subject behaviour' depicts the heat stress in a vivid manner.

The movement of the hand of the young woman soaking her feet at the fountain jet (Photo 7) or the way the mother makes her child wear the cap (Photo 6) or the woman shielding her eyes (photo 12) indicate the moments of seeking relief and protection. Going further this also implies the personal strategies used to negotiate with the heat.

- 'Visuals as denotative system' or the first level of framing talks about meaning-making through presentation of visuals with texts, captioning or groupings. The concept of applying Gestalt principle of proximity and similarity can be used to group the images for presenting to different stakeholders.

- 'Visuals as Ideological Representations' can be used to analyze the vulnerability to heat stress, across age-gender-economic strata and geographic location. Vulnerability is context specific and who becomes vulnerable to heat-stress, in what social, economic, cultural or political context is important to assess the nature of vulnerability.

Based on this analysis, I grouped and reorganized the visual frames to develop thematics or virtual narratives. Virtual narratives are groups of visual frames that narrate a story together or have similar visual elements to express an idea, more vividly and effectively. Visual narrative can be considered a broader category, that may have a subcategory or a sub-narrative elaborating finer nuances of the Idea. The table below gives a summary of this exercise.

Number	Visual Narrative	Visual Sub-narrative
1	People actively seeking shade	
2	People negotiating with heat	Using Folding-fans and table fans
		Splashing water on body
		Using sun-screens, gloves
		Shielding eyes
		Drinking Water
3	People and Heat-relief Interventions	People at the Water-stand
		People at water fountains, water-jets
4	Vulnerability to heat stress	Homeless People
		Migrants
		Labourers
5	Concrete spaces, Buildings and Heat	Glass facades
		Concrete spaces like streets, buildings, high-rises
6	Miscellaneous	

Table 2 Summary of Visual Narrative and Sub narrative

Photo 17: Visual Narrative 1-People Actively Seeking Shade

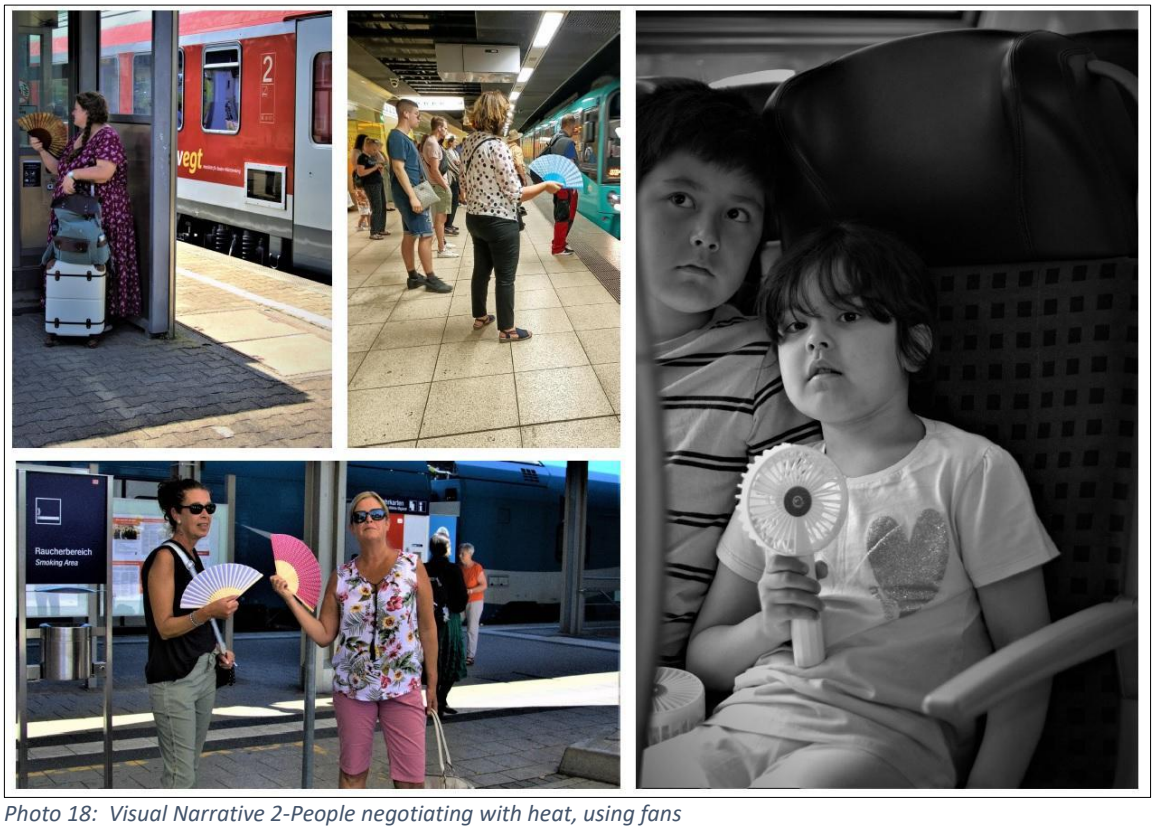


Photo 18: Visual Narrative 2-People negotiating with heat, using fans

Photo 19: Visual Narrative 3- Heat Relief Interventions-People at water fountains

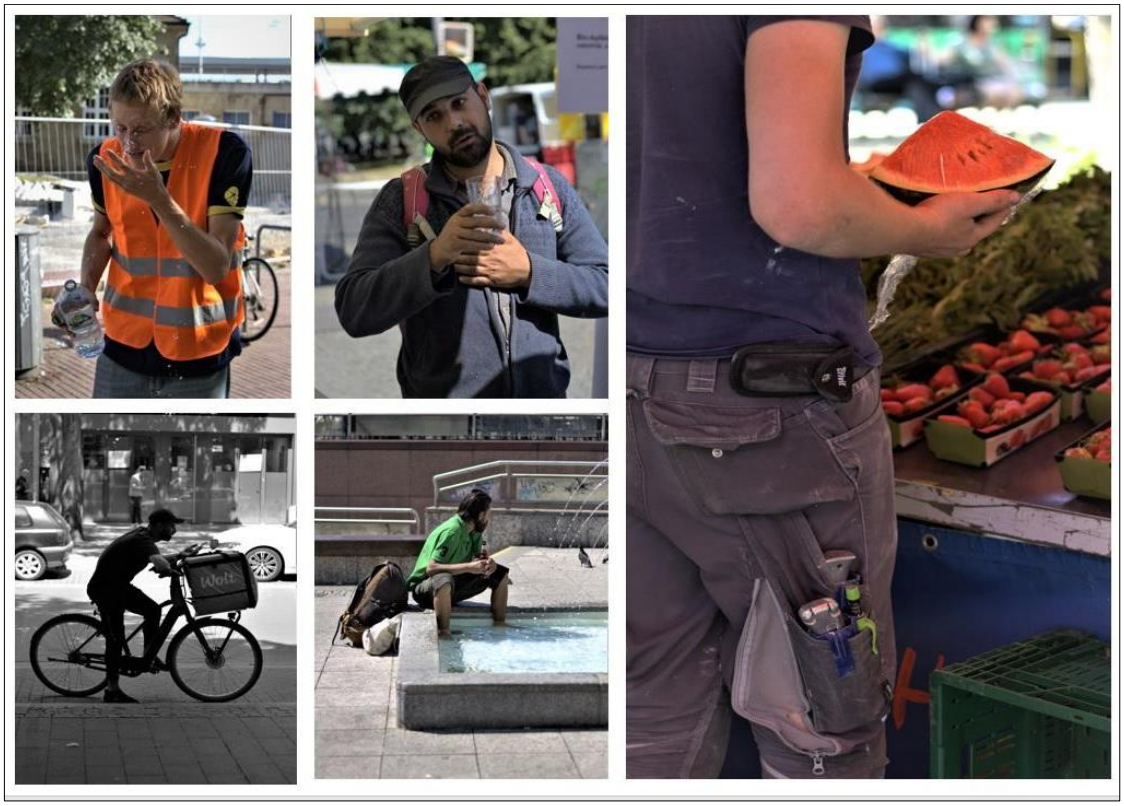


Photo 20: Vulnerability to heat stress, Labourers, Homeless and Migrants

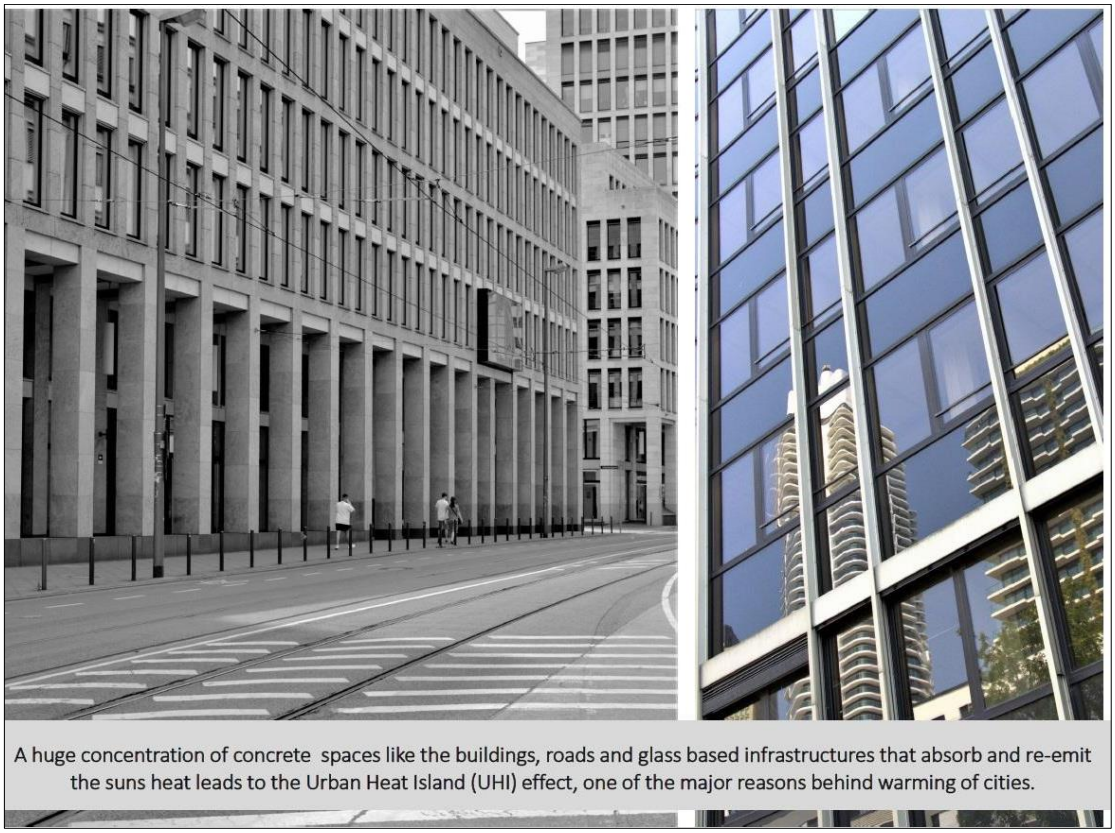
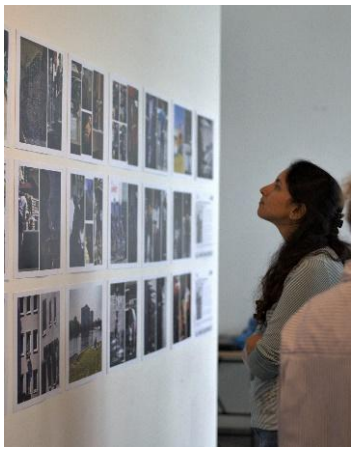


Photo 21: Visual Narrative 5-Concrete Spaces and Glass Buildings

4.3 Photo-elicitation workshop and Exhibition

The visual narratives and a few Visual frames were used for Photo-elicitation workshop, exhibitions and displays to understand people's response to the images. In photo-elicitation workshop, the visuals were shown to members of the Green Party and Urban Practitioners (Urban Planners, Landscape Architects, Environmental Engineers etc.), their response was elicited in focused group discussions. The photo-display and Exhibition in Dresden were meant for the general public, where viewers' response was collected through participant observation and informal conversations. The visuals were deliberately displayed without frame-wise captions or separate taglines but a short introduction to the exhibition was played.



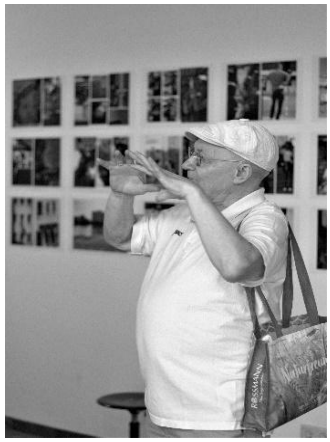


Photo 22: Photo-display in Dresden and Viewers (Below)

4.4 Phase II Results: Viewers Response to the Photographic Images

- The visuals invoked a sense of increasing heat or cities getting warmer, among the viewers. Stand-alone visual frames like 'People splashing water on face or hands', 'people's behaviour at the water fountains' as well as visual narratives of 'People negotiating heat, using hand-fans', 'People actively seeking shade' created an immediate connect with the viewers. Most of them identified with the visual frames or recognized the narratives to be a 'familiar situation' in their neighborhoods or with their friends and relatives.

- Visuals involving kids, or kids with parents or women figures drew reactions expressing concern as well as a sense of better familiarity. Photographs showing ‘Drinking water stands’ or ‘People queuing up at water stands’ elicited similar responses.
- Visual-frames of Concrete Spaces or Visual narratives involving ‘Glass-facades and Buildings’ did not generate any response from general viewers, though the pictures resonated exceptionally well with urban practitioners. Photographs involving heat relief interventions, like the cooling-zones with water jets or water fountains or drinking water stands resonated well with members of the green party.
- Miscellaneous Visual Narratives included ‘Birds and Pets taking shower at the fountains’ or ‘People buying watermelons’ led to different interpretations. Stress experienced by pets and birds were instant connected. Visuals with watermelons invoked deeper personal memories for many viewers, a few of them associated it with summers and warm temperatures.
- The urban practitioners as well as green members mentioned that the visuals pointed out a lack of greenery in many parts of urban landscapes, especially around concrete spaces and it could be addressed through carefully thought landscaping or urban designs. Many of them expressed concerns about inadequate drinking-water stands or insufficient cooling zones in public places with more daily footfall. The heat stress for children was a major point in the Focused group discussion. Participants highlighted the urgent need to train children to speak about the heat-stress experienced by them.
- The informal conversations with the general public brought out nuances of visual frames. Many viewers expressed familiarity with the situations depicted (People actively seeking shade or Splashing water on body) or the locations shown in the visuals (in the market, at the bus-stop) A few viewers proactively shared their experiences on warmer days and the strategies they use to beat the heat. Visuals of Drinking water stands and water fountains invoked a sense of refreshing feel or relief for most of the viewers.

The broad observations, reactions and responses from the viewers helped mapping the significance of visual frames in communicating heat stress. It led to developing recommendations for effective communication, as discussed in the next chapter.

CHAPTER 5: DISCUSSIONS

This chapter discusses the results of investigation with reference to the research objectives and develops a comparative overview of results. The visual frames and visual narratives of urban heat stress, as presented in the previous chapter, lead to several takeaways. A wholistic discussion on the results follows ahead:

5.1 The missing links in Climate Change Communication

The literature study showed that climate change communication so far, has been dominated by 'information-deficit' modelled science communication and given the apparent inefficacy of this approach, the discourse of communication is shifting from deficit to dialogue, underscoring the need for more public engagement. There is a great deal of discussion on effective ways of engaging people with climate action and studies have shown the potential of visual media to seek better engagement. The literature review showed that the challenge ahead of using visuals effectively is the image problem characterised by a restricted set of visual associations with climate images in the public mind. The image problem looms over the visual communication. The image problem has its roots in a deeper, more serious 'Perception Problem' stemming from the disconnects or gaps in people's perception about climate change. The perceptual barriers prevent people from seeing climate change as a serious problem or an issue that requires urgent action (Sheppard, 2012). Under-addressing the perception problem is a serious missing link in climate change communication, more so in the visual communication. Sheppard (2012) argues that visual media can be used innovatively and effectively to create more awareness among people and address perceptual barriers.

The lack of awareness is more pronounced in the communication about urban climate challenges. There is abundant literature like numerous reports, advisories, articles available about creating climate awareness but communication literature addressing the specific topics of urban climate, like the Urban Heat Island effect or Urban Flooding is not very common.

The literature study helped identify these major gaps in climate change communication. The research investigation focused on developing a repository of visuals of urban heat stress and vulnerabilities, using documentary photography. The idea behind developing a repository of visuals is to create a collection of visuals that would capture maximum possible dimensions of urban heat stress, their impact on people's day to day life, the associated vulnerabilities and adaptation solutions. The repository was not to include the stock images or existing body of work but the visuals were thought to come through first-hand, on-field photography, using documentary style. The entire work is available in the appendix section.

5.2 Comparative Overview of the published work

The image library is a popular concept, especially on digital platforms and there are numerous stock-photo libraries like the Shutterstock, Adobe stock, Alamy or Getty images. This section gives a comparative overview of the existing work with a focus on heat stress visuals, encompassing contributions from organizations, climate communication researchers', newspaper journalists and photojournalists. This overview helps understand the salient features of a specialised repository of urban heat stress visuals, created as part of this research work.

5.2.1. Climate Visuals,UK

Climate Outreach, UK has curated, ‘Climate Visuals Programme’ which is the world’s only evidence based and impact-focused climate photography resource’’ (Climate Outreach,2022) that makes available photos, visual stories, and insights on climate change. The website mentions that, instead of the traditional climate imagery ‘’developed by and for white, middle-class, western environmentalists’’, climate outreach’s narratives and images raise the voice of those most impacted by climate change around the world, in the process recognizing them in the climate change story. As a result, we get to see a wide variety of climate photographs from across the globe.

The Climate Visual’s image library has categories or collections like Climate Impact Visuals, Climate Solution Visuals, Ocean Visuals and so on, providing a comprehensive collection of climate photographs. Search query like ‘Heat’ fetches a number of photographs, including the visuals depicting impact of heat waves but the visuals of urban climate change and specifically of urban heat stress are less in number. Comparatively there is a great variety of photographs showing floods, sea-water rise, forest-fires, where cities appear in context at times. A representative selection is given below:

Photo 23: Stationary Traffic in the Heat, Timothy Large (2016), Alamy Stock Photo, Source: climateoutreach.org/climate-visual

Photo 24: Four women seated in shade in a park during hot weather, Guy Corbishley (2018), Alamy Stock Photo, Source: climateoutreach.org/climate-visuals

Photo 25: London Hotspots during heatwave, Richard Baker (2013), Alamy Stock Photo, Source: climateoutreach.org/climate-visuals

Photo26: Londoner in the Heat, Christian Julliard (2010), Source: climateoutreach.org/climate-visuals

The climate visual image library sparsely considers the urban heat stress. The visuals imply heat connotatively and through subject behavior.

5.2.2 Visual Portrayals of Heatwave in European News Media

News media often plays a key role in communicating the climate crisis, in turn shaping people's perception of the risks. Media has presented extensive visual coverage of heatwaves and a critical analysis of the imagery provides insights into the way heat-stress is framed. Visual communication researchers from the UK, Germany, France, and the Netherlands provide a comprehensive scholarly investigation of the visual news coverage of 2019 heatwaves in these countries (O'Neill *et al.*, 2023), that serves as a major reference point to understand how extreme heat is narrated, conceptualized, and visualized. The content analysis and visual critical discourse analysis of the visual narrative reveals the problematic conceptualization of heatwave risks and major findings are as follows:

- Heatwaves as '*Fun in the Sun*'
  All four countries depicted heatwaves through activities in outdoor space in the sun, leisure activities in or by water and that of enjoying sunshine. The facial expressions and body language of people shown in the images were of happiness and excitement. Sunny skies, azure water and people socializing, smiling-laughing, playing by it depicted the look and feel of summer holiday snaps. People's enjoyment in the vicinity of iconic places like Eiffel Tower became a repetitive visual motif across the news coverages. This depiction reduced the heatwave visuals to 'fun in the sun' visuals.
- Visuals depicting the 'Idea of Heat'
  The 'Idea of Heat' was depicted through range and red colours that signify danger, thermometers depicting high readings, wildlife imagery but people were not at the center of this coverage. De-personalized human figures making appearances in shadow or silhouettes were featured.

- Dissonance between Visuals and Accompanying Text
  There was a mismatch between the heatwave visual and the accompanying texts. This dissonance and considerable variation between the news text and the image was common across all four countries.
- The absence of Climate Solution Imagery
  Rather than stories of negative climate impacts, Climate solutions or positive adaptation to heat has a direct connection with enhanced climate engagement (Doulton and Brown,2009; Hulme,2009; O'Neill et al.,2015 cited in O'Neill et al', 2023). However, the visual portrayals of heatwaves considered in this study had an absence of climate solution imagery, the only exception being local and regional news organization in the Netherlands, Algermeen Dagblad (AD).

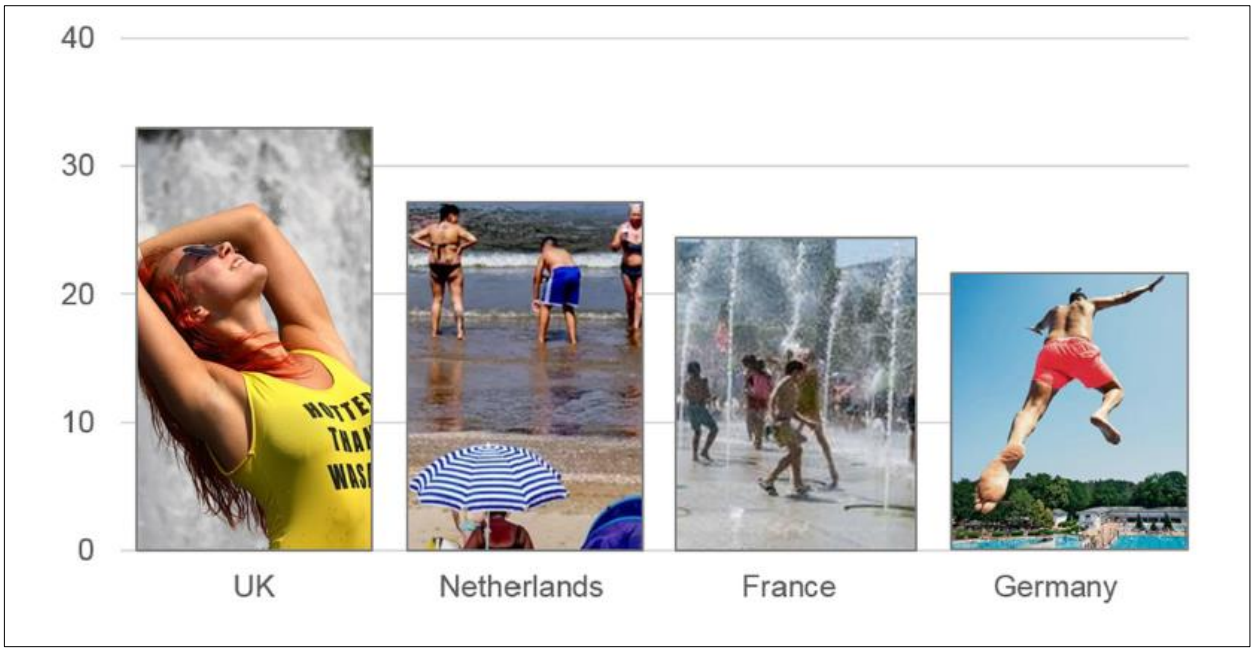


Photo 27: media images depicting the percentage of 'leisure activities in or by water', by country. Source: O'Neill et al.,2023. Doi -doi.org/10.1111/geoj.12487

Photo 28: A composite photograph of Heatwave Visuals in European Media, depicting the 'Leisure activities in the Sun'. Source: O'Neill et al.,2023. Doi -doi.org/10.1111/geoj.12487

O'Neill et al. (2023) elaborates that these findings point to a problematic and misleading framing of heatwaves, which has larger implications on public engagement. Heatwaves can be funny for some at some point but the visual framing of heatwaves as 'fun in the sun' displaces the everyday realities of heatwaves experienced by people at homes, at workplaces or even during transit. Visual coverage like this not only reduces the seriousness of the issue but it also eliminates the scope of highlighting vulnerabilities created by the heatwave, further marginalizing the marginalized sections of society, effectively rendering them voiceless.

The Idea of heat depicted in the visuals does not feature human stories, which leads to a distancing experience for the readers because they fail to identify themselves with the stories or think that the issue is far from them. This 'distancing' Visual framing described by O'Neill (2020), is also one of the reasons for perceptual barriers discussed by Sheppard (2012).

The study underscores the urgency of producing visuals that depict everyday living with heat, sensitive to heatwave risks and at the same time not alarming or fear inducing.

5.2.3 Feature Stories by CBC News

CBC News, a division of Canadian Broadcasting Corporation has published a series of feature stories on Urban Heat. Feature story is a long form, non-fiction piece dedicated to a single topic in detail. The CBC has developed feature stories in a visual, interactive format.

Sweltering Cities (Bernstien,2022) is the feature on extreme heat in Canadian major cities and climate casualties in the backdrop of climate change and more intense, frequent heatwaves.

Using interactive visuals like maps, graphs, videos and photographs, the story covers Urban Heat Island (UHI) effect in depth, familiarizing readers with concepts like surface temperatures, air temperatures, heat-domes and impacts of UHI on human life, vulnerability to extreme heat events. The feature story uses photographic images of people's experience of heat stress on the streets, inside their houses or other built spaces and the vulnerability associated with it.

Photo 29: Man standing in Balcony, Maggie MacPherson (2021), CBC

Photo 30: Man looking out the window, Ben Nelmes (2021), CBC

Another feature story, Cooling Canopy (Bernstien,2022) talks about the significance of shades, greening and canopies to deal with heat. This story uses the format of story-telling but it uses

more photographs to showcase the unequal distribution of canopy and greens in the city, the marginalized neighbourhoods, and their vulnerability to heat.
The argument presented in Cooling Canopy (Bernstien,2022) about urban shade being reserved for the rich, has been elaborated in a far nuanced and layered manner in Sam Bloch's work. A Los Angeles based journalist and writer Bloch (2019) presents the urban sociology of shade. He propounds that shade is a civic resource and an index of inequality. Unequal distribution of shade, who gets access to shade in urban life and who is denied the access to shade reveals about contemporary urban planning, urban designing, and environmental injustice. He further refers to uncanopied surfaces, concrete-glass buildings and UHI and the health impacts for poor, homeless and marginalised populations. Bloch uses photography, graphs, and maps to illustrate the distribution of shade in a comparative manner and the stress it creates for people. Bloch's elaborate arguments on shade as a public resource and Bernstien's richly resourced photo-features provide a strong case for urban shade. My work explores this angle with a special theme / visual narrative on people actively seeking shade. The point of difference is that Bernstiens work addresses stress caused by heatwaves, while my work discusses stress on hot days.

5.2.4 A Photojournalists take on Heat Stress

Last but not the least, 'Too hot to Work' is an important photo-essay by ace photojournalist Ed Kashi (2022) that depicts health impacts of heat stress on Nepalese migrant workers, working at construction sites in Qatar around FIFA World cup 2022. Ed Kashi sets his story in Qatar, known to be a hot and humid place and reports about heat stress in day-to-day life of construction workers. Without going into technical details of UHI or shade, he uses powerful visual frames depicting an urbanscape in transition with soaring temperatures, humidity, under-construction buildings and vulnerability of workers.

Photo 31: Worker drinks water at construction site, Ed Kashi (2022)

Photo 32 : Workers at Construction Site, Ed Kashi (2022)

Photo 33: Workers putting final touches, Ed Kashi (2022)

A comparative understanding of the visuals curated at Climate Visuals library, the comprehensive analysis by O'Neill and other researchers, Bernstiens educative, image-based feature stories, Bloch's passionate argument that uses photographs and Photojournalists Ed Kashis treatment of heat stress bring to fore key features of visual framing in practice and also different styles of photo-narratives and storytelling, considered crucial for communicating

climate change to a varied audience. In this backdrop, I find certain similarities and differences in my photographic repository.

5.3 Key Features: Repository of Urban Heat Stress Visuals

My work in the visual repository encounters similar situations analyzed by O'Neill et al. and addressed by Bernstien and Bloch. The main difference lies in the approach to situate and explore the subject matter on specific counts.

5.3.1 Everyday Urban Experience of Living with heat.

Firstly, my work is urban context specific and it distinguishes between the heat-stress from heatwaves and stress generated by higher to very high temperatures in everyday urban life. While the heatwave lasts for a longer duration, often between 8 to 10 days with considerably higher temperatures throughout the day, there is a certain period in every 'non-heatwave' summer day when temperatures are higher than usual, often exacerbated by the UHI effect. The heat-stress experienced during this period are commonplace but hardly find a visual voice. My visuals focus on highlighting this niche gap, bringing climate change induced heat extremes closer to home, closer to workplaces and public spaces. It captures that emotional array of irritation, frustration people experience due to urban heat, depicted connotatively and symbolically as well as the non-human figures like the pets, the birds and animals facing heat.

Photo 34 :Daily Commuters in Frankfurt, face strong glaring from the glass facades of buildings. Glass buildings contribute to the UHI

Photo 35: Men responding to the heat stress, seeking relief in Frankfurt

Photo 36: Animals and Heat Stress

5.3.2 Everyday Vulnerability to Extreme Heat

Another central aspect of my work is consciously profiling the different layers of vulnerability along the age-class-gender-ethnicity axis. The political economy of global climate crisis, wars and forced migration has transformed European Urbanscapes into migration destinations. The under-privileged population is vulnerable to urban heat stress to a great extent and my visuals capture the human face of the same.

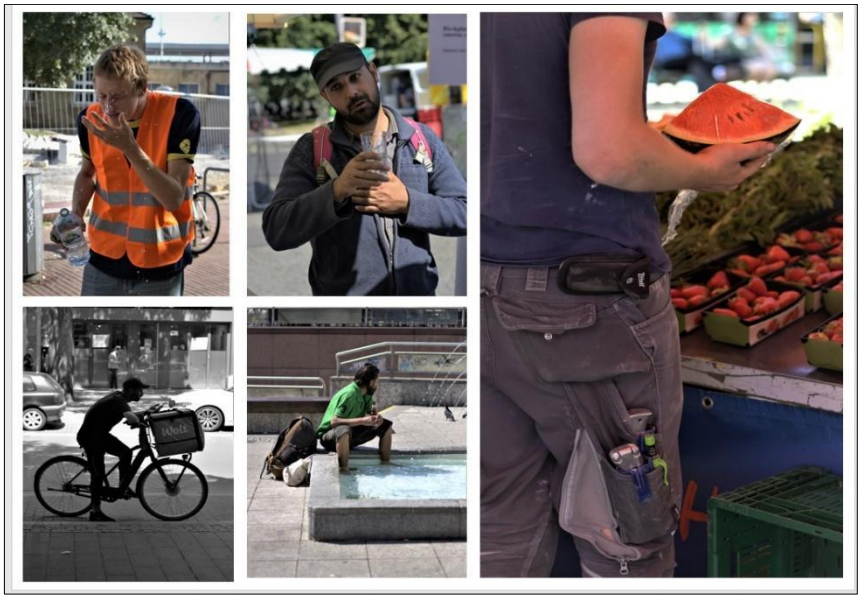


Photo 37:The heat stress experienced by workers, migrants and homeless in different cities of Germany

Photo 38: Heat Stress experienced by Kids of various age-sex-class-ethnicity is another layer of vulnerabili

5.3.3 People's Agency and Coping with the Heat

Lastly, my photographs consider not only how people experience the heat, but also the way they negotiate with it, through personal adaptation strategies like actively seeking shade, cooling-off at water places, using hand-fans. The visual frames also establish people's agency because people do not meekly submit to heat, they devise their personal adaptation strategies, chart out their own course to cope with the heat. This also involves trivial, highly localized strategies like more consumption of watery fruits like watermelons on warmer days. My visuals focus on this process of coping with the heat.

Photo 39: Actively seeking shade is a personal adaptation strategy for people experiencing heat stress

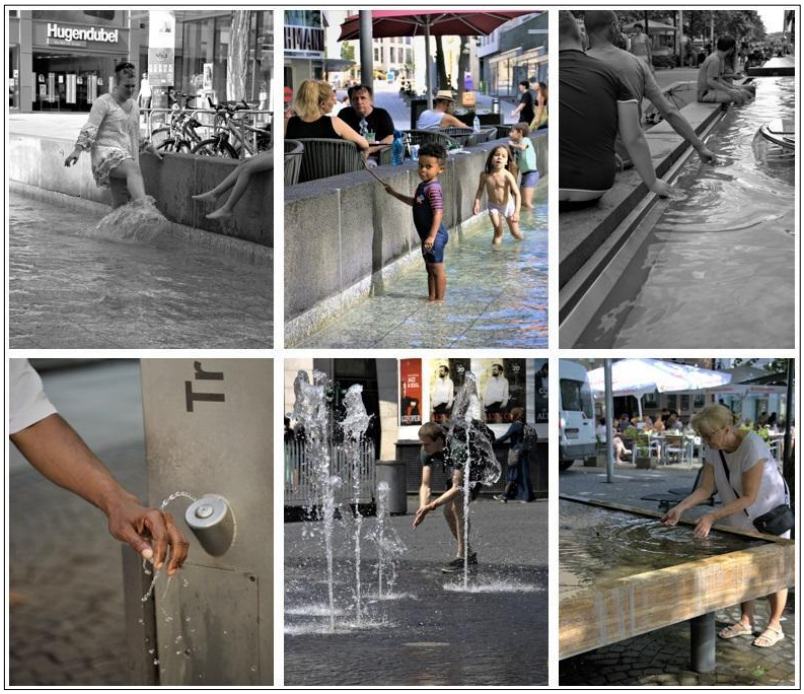


Photo 40: Cooling off at Water fountains and splash parks is a personal adaptation strategy for people experiencing heat stress

Photo 41: Personal Adaptations and Coping with the heat

Photo 42: People across age-sex-class buying watermelons. Watermelon consumption is associated with summer, higher temperatures, and heat.

Thus, the visuals of urban heat stress connotatively establish the idea of heat and addresses the everyday experiences of living with heat, as against the visuals of heatwaves that dominate the contemporary visual discourse. In the process the documentary style of photography is used, which is found far more suitable for producing results.

5.4 Documentary Photography and Climate Visuals

Different genres of photography can be used to produce climate visuals. When it comes to the visuals of climate change, we know that Visual Sociologists or Visual ethnographers capture photographs of the subject matter, we see news media visuals captured by the photojournalists and then certain kinds of photographs are known as documentary photographs. While the subject matter remains the same, the treatment and approach changes. Visual Sociology, Photojournalism and Documentary photography are basically the social constructions and their meaning arises in the context of the photographic work they are applied to (Becker, 1995). It is important to know how the photographic treatment differs, in the given context and how it matters for the climate visuals this research envisages. We will limit our discussion to photojournalism and documentary photography.

5.4.1 Difference Between Photojournalism and Documentary Photography

Becker has provided a pioneering analysis to understand the basic difference, with reference to the historical and organizational context. Photojournalism refers to the practice of journalists producing images as part of their work for the newspapers or magazines. The main attributes of a photojournalistic image are unbiasedness, factuality, and completeness while the image is supposed to be courageous, getting attention and telling a story. As the photojournalistic images are meant for newspapers, where readers are in a rush to understand the crux of the story, the images need to be immediately readable and interpretable. Readers do not prefer to spend time on interpreting the complexities involved in the photographs (Hagaman, 1994;1996 cited in Becker,1995). This is a structural constraint in photojournalism. The other constraining element is the editor's choice of handing over photographic assignments, which seldom offers an opportunity to get seriously involved with the field and develop a nuanced understanding of the issue, the way news-reporters develop about their beats. Given these constraints, the images produced by photojournalists reflect superficial understanding of the subject matter and its varied dimensions. However, the photographs are technically sound, aesthetically near-perfect and eye-catching for the general reader.

Documentary photography has evolved from two major influences, the reformist vision and the exploratory vision. The reformist vision of documentary photography expects the photography to play an active role in social change and be responsible to society. The exploratory vision expects the photography to explore, record, document the society, the changes within. The exploratory vision is reflected more in social sciences and shaped contemporary documentary photography. The context provided to the documented photographs gives meaning to the images in viewers minds. If the context is not provided, viewers provide it from their own resources, like their interpretive capacities. There are different techniques as well as debates about how to provide the context but documentary photography has space to capture and convey multiple layers of meanings.

Becker (1995) shows that depending on the context, a documentary photograph can be read as a journalistic picture and vice versa.

5.4.2 Why Documentary Photography matters for Climate Visuals of Urban Heat Stress

Urban heat stress is a difficult challenge to depict in photographic form for following reasons:

- The ‘audience frames' or the way people understand and interpret urban climate crises in their mind, are not established due to the image problem and perception problem (Sheppard, 2012).
- The nature of heat is intangible. One cannot ‘see’ heat the way one can see water/floods, forest-fires, and sea-level rise. The denotative visual frames are hardly applicable to heat, which takes depiction through connotative frames, with the help of objects, symbols and signs.
- Urban Climate Change is a specialized topic. A communicator needs to develop a basic understanding of challenges like UHI, air-pollution, the urban systems like transport, built environment, energy requirements etc that shapes the impact of Urban heat stress, in day-to-day life.

The very nature of photojournalism hardly allows time to develop this understanding about the field or the frame-building. The superficial understanding of the topic leads to presenting misleading frames. The ‘Fun in the Sun’ framing of heatwave visuals by the majority of European media, as demonstrated by O’Neill et al. (2023), is a case in point. The local and regional news organization in Netherlands, Algermeen Dagblad (AD) could produce solution journalism oriented, realistic, closer to home heat visuals of everyday life because the agency commissioned special freelance photographers to produce the images to accompany the story. We get to see the similar approach in feature stories by CBC News, where near perfect, realistic visual depiction of local urban climate heat stress accompany the story. The photos accompanying the journalistic stories appear to be documentary photos in nature.

Documentary photography allows the time-frame for registering consistent observations over a longer period. This helps understand the unfolding of urban heat stress at ground level, at homes, at marketplaces, workplaces and imparts a rigour to narratives on human stories. It also allows us to understand, conceptualize, and then visualize urban heat stress in connotative framing as well as in stylistic-semiotic framing. This analysis establishes the significance of documentary photography for capturing urban heat stress.

5.5 Peoples Response to Climate Visuals

Developing visual frames of urban heat stress is crucial, but developing an understanding about how people ‘understand’ these visuals or how do people engage in ‘meaning-making’ of the visuals is far more crucial for devising strategies to seek meaningful public engagement with local climate action.

5.5.1 Climate Visuals and Urban Practitioners

I deployed the photo-elicitation method to know how the urban practitioners and Green party workers understand the climate visuals. I sensed a general level of awareness about the extreme heat with members of both the groups. Urban practitioners acknowledged the larger issue of urban heat stress and need for climate action but appeared to be biased towards their professional competency. Urban designers drawn more to visuals showing ‘street-side splash

parks' or 'concrete spaces without shades' or 'people actively seeking shade' implied a visual bias but it underscored the significance of particular visual frames to incite response from particular key-stakeholders.

As a general observation, members of the Green party were moved by images that could spell action or suggest a solution. Visual frames involving 'jet fountains' or 'splash parks' or 'people cooling off at water fountains' were perceived as solutions that could be replicated elsewhere for creating heat-relief. These insights came out in the Focused group discussion conducted right after the photo-elicitation.

Visual Narratives or thematically arranged visual frames resonated well with urban practitioners. Many of them shared in informal conversations that visual narratives gave them a holistic view of a particular dimension of the urban heat challenge, for example the visual narrative of UHI involving glass facades-concrete spaces and high-rises resonated well with environmental engineers and architects. A few Urban practitioners mentioned that the visual narratives, rather than visual frames, helped them understand the crux of the issue in one go and set them in a thinking mode. This highlighted that the way visuals are presented matter a lot for the audience and visual narratives can become very effective in providing encapsulated, concise information to technical audiences.

5.5.2 Climate Visuals and General Public

While I was in the process of organizing photo-elicitation sessions, I received a welcome opportunity to display the visuals at a three-day long Nature Based Solution workshop in Dresden and subsequently at a major 'open to all' window-exhibition in the Green party office in Dresden. The photo-display and photo-exhibition were not planned initially but emerged as a parallel development. Receiving an invite to exhibit the heat-visuals for the general public can be considered an acknowledgement of the convincing power of climate-visuals to generate more dialogues and conversations at local level. It was also a significant opportunity to understand how the general public -without any technical background like the urban practitioners or an active context like the Green party members- would read the climate visuals. The general viewers were well-receptive of the heat-stress visuals, though there was a pattern in their reactions to the photographs. The visuals in the display were a mix of stand-out visual frames and visual narratives. The short, informal conversations about peoples' first reactions upon seeing visual frames (nodding head approvingly, smiling to self, showing the visual to people accompanying them or discussing in front of a particular frame, informal remarks like 'Oh, this is so me!', 'I do the same when at fountain' etc.) revealed that people connected instantly with the visual frames involving water, involving kids and objects like hand-fans, umbrellas etc. The visuals of people splashing water on their face/hand/feet or people cooling off at water fountains or splash parks revived the association between extreme heat and water as a coolant in viewers' subconscious minds.

A quick analysis of this response brings forth the role played by 'audience frame' in the visual meaning-making or sense-making process. In framing theory, the audience frames are known as the mentally stored principles for information processing (Entman,1991 cited in Rodriguez and Dimitrova, 2011). Goffman (1974, p.10, cited in Rodriguez and Dimitrova, 2011) explained that the active classification and organization of audiences' own life experiences help the audience make sense of them and these frames enable individuals to "locate, perceive, identify, and label" the world around them. The explanations by Entman and Goffman were

mainly in the context of textual frames but I could see their applicability in the visual interpretation of heat-stress photographs displayed in the exhibition. At one level, this illustrates the importance of knowing your audience for creating the right impact through visuals while at another level it explains the significance of producing visuals with locally rooted human-stories.

5.6 Looking Back at the Field-engagement

This research investigation is a field-based experiment that involves field exploration, human interaction, and photography. The features of the experiment are given below:

- Visual ethnography is a unique approach to understand the challenge of urban heat stress from a different, rooted and more localized perspective on communication for enhancing public engagement with climate action. The approach created various opportunities to engage with people of different age-sex-class-ethnicity across different urban geographies of Germany and visually document first hand lived-experiences of urban heat stress.
- Research methods like field-exploration, the literature study, interviews with experts and informal conversations with people helped me identify layers of climate vulnerability in urban setups. I could satisfactorily explore and visually document the everyday vulnerability to urban heat, experienced by migrants, homeless people, and labourers.
- The people-centric visuals of urban heat stress came out in an authentic, ethical, and reliable manner, uncovering myriad layers of urban heat stress and creating engagement with different stakeholders. The high point of engagement and an acknowledgement of the efficacy of visuals came in the form of a public exhibition of the visuals in Dresden. It created more dialogue and ways of engagement.
- Ethnographic fieldworks rely on rapport-building and trust-building with the communities or the people we study, that needs long term associations. This was not possible in the given time-frame. The camera-gaze may become uncomfortable for many. These factors combined with the privacy concerns of people, resulted in not getting access for indoor shooting and for the close-contact photo documentation, mainly the portrait photography.
- Urban Heat stress is experienced in outdoor as well as indoor setups like the homes, workplaces, care homes, hospitals, schools. Photographing these spaces with a focus on inhabitants would reveal far richer visual insights about the thermal comfort, the physiological effects of heat etc. I could mind-map and build the frames or could imagine how this could be photographed, but unfortunately could not capture it photographically due to the lack of access.
- While the visual documentation worked well, dissemination of this work to multiple stakeholders in different cities through interactive workshops could have been improved. It was not possible in the given timeframe. However, the experience of photo-exhibitions, photo elicitation workshops has shown new ways of engaging with stakeholders.

- In the methods of collecting visual data, I used the photo-elicitation method successfully. Photo-voice is another method, which compliments photo-elicitation to a great extent. Photo-voice encourages the participants to take photographs of their surroundings and discuss it afterwards. Photovoice would have been a great method to map and understand how the 'audience frames' of urban heat stress work or how people actually 'see and capture' the urban heat. Photo-voice needs more time and continued interactions with participants, which were constraining factors for me.

5.7 Towards Enhancing Urban Resilience

Towards the end, the discussion on the importance of visuals for creating awareness about urban heat stress can be contextualized in Sheppards 'Community Awareness to Action Framework (2012), which describes ways of creating awareness about climate problems. In this framework, individuals' attitudes and behaviours are affected by external influences. Hence, external influences can become instrumental in shifting the level of awareness from 'seeing' or 'hearing' to 'recognizing' to 'caring' and lastly into action. Behavioural changes are desirable and can be achieved if perceptual barriers are addressed, by making them more local, visual and connected. Sheppard suggests that visual media can become an influential tool to make the general public more aware about the climate challenges and engage with them.

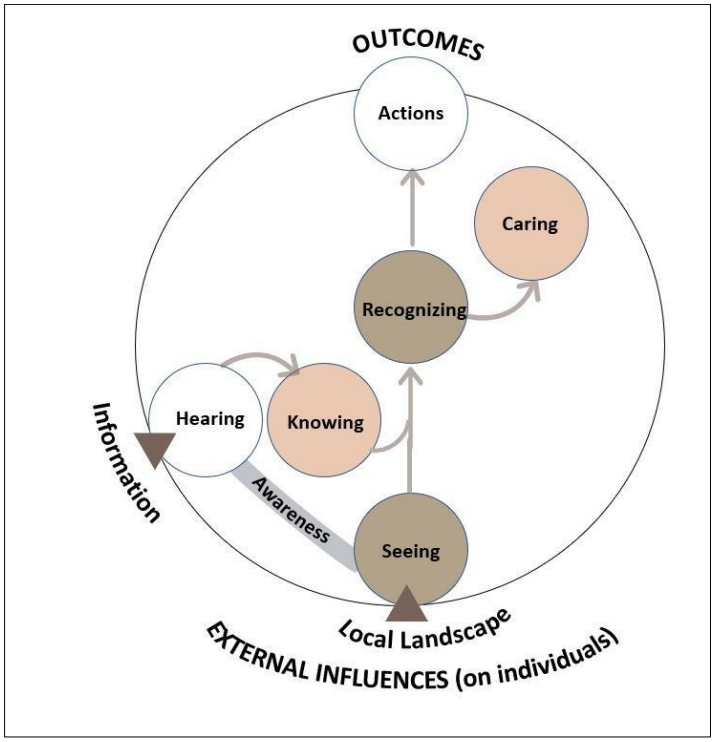


Figure 6: The Community Awareness to Action Framework, (Sheppard, 2012)

The Visuals of Urban Heat stress experienced by people at local level can become a powerful external influence that can help people 'see' urban heat stress in a more 'local, visual and

connected' manner. The visual frames have the potential of shifting the level of awareness about urban heat stress from seeing to recognizing to caring and leading to actions.
At this point, the enhancement of resilience comes in picture. Urban resilience is understood as the capacity of a city's systems and stakeholders to survive, adapt, and maintain continually throughout the stresses and acute shocks they experience. Resilience is highly associated with people's engagement in climate action. Sheppard has shown the transition from seeing to actions, in local landscape. This research demonstrates that visual frames of climate stress at local level, has a potential of enabling people 'Recognize' the climate stress around them, urban heat stress in the specific context of this research. Visual communication through documentary photography can be a great tool towards this end and contributing to enhancing the urban resilience. We need precise strategies to communicate with people with the help of visuals.

The last chapter sets out recommendations for effectively using photographic images in urban climate change communication to influence public engagement.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

- Climate Change Communication so far has been dominated by 'information-deficit' model led science communication but given the inefficacy of this approach, the discourse of communication is shifting from deficit to dialogue, underscoring the need for more public engagement. Visual media can be instrumental in engaging the public.
- Climate change communication has image problems and perceptual barriers. The perceptual barriers prevent people from seeing climate change as a serious problem or an issue that requires urgent action. Under-addressing the perception problem is a serious missing link in climate change communication, more so in the visual communication.
- Literature survey of Visual Climate Communication discourse illustrates that the Urban Heat Stress is a blind spot in visual communication, despite being a highly pertinent challenge.
- Documentary photography can be used effectively to create visual frames of urban heat stress. The defining features of documentary photography like the issue-based coverage, nuanced understanding of the topic and longer breathing space, make it a potent tool to capture visuals of urban heat stress.
- Creating visual frames is an elaborate process that can be accomplished through field-based visual investigation, supported by visual ethnography and framing theory. Framing is an important concept that explains how the information is presented to the audience or how information is framed influences the perception of the audience. Using the concept this study created a repository of photographic visuals of urban heat stress.
- Everyday urban experience of living with heat, everyday vulnerability to extreme heat and Peoples agency coping with the heat turned out to be salient features of the repository.
- Visual frames of Urban Heat Stress resonate well with different people at different levels. Visual Frames can be arranged together to form visual narratives that have a different appeal and influence on viewers. Visual Frames and Visual Narratives open myriad possibilities of creating multiple engagements and dialogues through photo-exhibitions, photo-displays, and informal conversations.
- The photo-exhibition and display highlighted the fact that people interpret visual frames and narratives differently, depending on their background, interest, and context of viewing. This provides rich insights into not only how to choose the visuals but also how to present them and in what context.
- Viewers have pre-existing references in the subconscious that they use to make sense of the visuals, known as audience frames. At one level, they illustrate the importance of knowing your audience for creating the right impact through visuals while at another level it explains the significance of producing visuals with locally rooted human-stories. Selecting the right kind of visuals for communication is the key to engaging with stakeholders more effectively.

This research led to creating various visual frames of urban heat stress, displaying them for a varied audience and seeking their feedback. The key takeaways of the process are presented below in the form of recommendations.

6.2 Recommendations

Urban climate change communication involves multiple actors like media, urban practitioners, Climate City Networks and City Councils, Advocacy NGOs, and climate educators. These actors continuously communicate with each other and with their target audience. Visual communication is an integral aspect of their routine communication practice. Specially created photographic visuals of urban heat stress can impart a distinct flair and enhancement to the communication, practiced by key actors. Presented below is a set of recommendations for creating effective photographic visuals of urban heat stress and using them in different contexts for enhancing the effectiveness of communication, in turn enhancing the public engagement.

- **Establish the idea of urban heat using photographic visual frames**
  Urban heat stress in everyday life is a serious challenge that is highly underrepresented in the visual communication discourse. Urban heat as a climate challenge has an Image problem and perceptual barriers. Media should use photographic visual frames to conceptualize, visualize and narrate urban heat, effectively leading to firmly establishing the idea of urban heat in public perception.

- **Use documentary photography to create visual frames of urban heat stress**
  Urban heat and subsequent stress have multiple dimensions, forms and expressions that affect everyday life. It takes a detail-oriented approach to produce content rich, effectively relatable visual frames. Given the elements of issue-based coverage, nuanced understanding of the topic and longer breathing space, it is advisable to use documentary photography style, to create visual frames for enhancing public engagement.

- **Keep it Local, keep it Connected**
  Photographic visuals that focus on the local experience of urban heat stress resonates with people; it makes them believe that urban heat is not a distant phenomenon but a part of their everyday life. It is highly recommended to create visual frames and narratives depicting the local impact of urban heat on people in everyday situations. Such locally rooted and connected visuals will be helpful for all the major actors, reaching out to their target audience.

- **Establish Peoples Agency through Visuals**
  Urban heat stress often renders people helpless but the resolute personal adaptations and resilience shown by people, illustrates that people have agency in coping with the heat. Specially created visuals can establish that people are not meekly submissive to this climate challenge but they are resilient, solution-oriented, and ready to participate

in action. Such solutions providing images are highly significant for media, politicians, and urban practitioners to seek better public engagement.

- **Create visuals of vulnerability to urban heat**
  Urban heat stress leads to multiple layers of vulnerability across the age-gender-class-ethnicity axis that is less explored and far less established in visual frames. It is recommended to create content rich visual frames showing the layers of vulnerability. Such visuals are crucial for Climate Networks, Advocacy NGOs, and Urban practitioners.

- **Develop more visuals of indoor heat stress and thermal discomfort**
  Urban heat stress is equally serious a threat within the indoors, inside houses-workplaces-transport facilities. Indoor heat stress and thermal discomfort is an absolute blind spot in the existing climate visual discourse. Developing the visual evidence of indoor thermal discomfort, profiling the human-face of indoor heat stress has a great relevance for sensitising Urban practitioners, generating awareness among general public and the city councils.

- **Sensitize the Influencers using Visual frames**
  In climate change communication certain niche actors become the face of the communication for the audience. They can be described as trusted messengers and audience influencers. Common examples include Weather report presenters on News Channels, Health Practitioners, Politicians etc. Visual frames of urban heat stress can be used effectively to sensitize these trusted messengers. Nuanced communication from a sensitized, responsible messenger has huge repercussions on the public engagement.

- **Integrate Urban Heat Visuals with the Intra-actor, Inter-actor communication**
  Communication between and within actors is a crucial ground of addressing perceptual barriers and creating perceptions. The internal, organization communication within the Transnational Municipal Climate Networks or Communication between city-mayors or the communication between Advocacy NGO and City Council or between Media and Urban Designers are cases in point. Integrating Urban Heat Visuals with the internal communication between actors can contribute towards addressing specific perceptual barriers.

- **Use urban heat visuals for specific educational purposes**
  Visuals of urban heat blend well with specific educational literature. They can be used for creating awareness about urban heat stress among special groups like children, migrant workers, homeless people or in specific literature like heat-wave advisory, practitioners guide etc. It is highly recommended to blend urban heat visuals in educational literature published by Government Agencies, Climate City networks and Climate Educators.

6.3 Future Scope and Way Forward

This research has contributed to creating a unique visual repository of urban heat visuals, in the process establishing great potential of documentary photography and visuals to engage with different stakeholders on the climate challenges of high local relevance.

This study brings forth numerous possibilities of effectively integrating photographic visuals in strategic communication, organizational communication, and rhetoric studies within the larger domain of climate change communication. In the broader context of climate urbanism, the study leads to further scholarly investigation into use of photographic imagery in perception-awareness and capacity building of a range of actors influencing the overall public engagement with climate action. This study also opens possibilities of intensive research on visual presentation of adaptation solutions, sustainable practices, and its association with public engagement in climate action.

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APPENDIX

Interviews

- **Mr. Toralf Staud**
  Author: Germany 2050-How Climate Change will change our lives
  Journalist & Editor – Klimafakten.de, Berlin

  Question: What is the level of awareness about Urban Heat Stresses amongst Journalists, Bureaucrats, Urban Designers and Communicators? How Does the German media cover heat-stresses in Germany?
  Answer: In Germany, we like to welcome warm summer but a longer summer with more sunny hours per day is proving stressful for many. The German mindset is undergoing a transition. We are happy about warmer summer days (compared to winters) but we are also aware about impending heat stresses. Communicating about heat-wave was a non-issue until recently. However, 2013, 2017 and 2022 has changed the perspective. Heat stresses are hard to see and hard to prove, so it was not reported exclusively but now it is being addressed with more seriousness. The media coverage of heat-waves is not accurate and pleasure-pictures or 'people enjoying the summer' kind of narratives dominate the scenario.

  Question: What are the vulnerabilities to urban heat stresses in Germany?
  Answer: The elderly people are more vulnerable to heat stresses. We need to look at heat - stresses from health-perspective. There has to be more awareness about heat-stresses amongst the aging population.

  Question: So, how do you think, we can create more awareness? Do we need to identify a specific set of stakeholders?
  Answer: For creating more awareness there has to be a recognition that climate change is a larger, political issue and to find a lasting solution, you need to go deeper, cut the emissions and address it a policy level.
  However, acknowledging its local impacts, there has to be a greater initiative from government authorities, to generate awareness amongst specific stakeholders. For example, In the media segment, weather presenters on daily news have a major influence on people's choices of stepping out/not stepping out on a warmer day. These weather reporters need to be sensitized about presenting local heat stresses to people, in a more serious manner than just reporting it casually. We need to identify a target audience, for addressing this issue. There are some particular examples. We need to get health-journalists and health-practitioners (Doctors, Nurses, Ambulance Service Operators) on board, making them more aware about the climate change induced urban heat stresses and its impacts on health as well as vulnerabilities it leads to. On the other hand, Architects and Urban Designers need to be more aware of the changing climate. Architects still plan huge windows to let the sunlight enter houses. They need to go for climate-sensitive designs and should improvise on the ongoing standard practices of designing a building. There can be better sensitization of these stakeholders.
  Politicians do not appear to be aware of urban heat stresses at local level and one needs to create more awareness about the issue with them, with a personal connect.

  Question: Do you think, Visual Communication, could be effective for generating awareness about urban heat stresses?
  Answer: Visuals can contribute a lot to mass-awareness campaigns, but we need better and more appropriate visuals of urban heat stresses. Infographics, Science Scenario Graphics and Photographs or Comparison Scenarios can be used as visuals. Communicating the Risk of Danger is important but providing solutions is important as well.

- **<u>Professor Dr. Torsten Schaefer</u> - 15 May 2023**
  Green Journalist and Founder Member of Climate Journalism Network Germany,
  Professor of Journalism and Text Production at the HTW Darmstadt, Germany

Question: What is your opinion on the CCC and Visual Narratives?

(Professor Dr. Schaefer's response to this open-ended question was more focused around contextualizing the Visual Narratives with reference to the climate change communication)

Answer: Communication is a very broad term and going beyond journalism or the public relations, one must include the communique issued by the city councils, academic institutes, universities etc. This broad spectrum of communication is dominated by Text Communication and opening the 'local eye' for communication is very important, for making the climate action more effective. Human eye is an important asset, especially for sensory experience of the changing climate and its impacts at the local scale. Human eye becomes even more important as we need to have a re-localisation of our current problems. Re-localisation is all about understanding the existing issues and problems from a more localised, 'down-to-earth' perspective. As per the French Philosopher (?) we need to identify ourselves in an all-new way right in the places where we live and we need to bring back our local places in association with our problems. Redefining our senses to local problems is important.

(Redefining the senses, can be stretched to redefining human eye to capture and make sense of the local issues, borne out of global issues like climate change. The local dimensions of a global problem like climate change are changing our local places-the places where we live, work, socialise, loiter- in an unimaginably new way. For example, the droughts, the heat stresses, the floods, and the forest fires are re-shaping our social ecology to an unimaginable extent, to which we need to identify ourselves with. If we could identify ourselves with the changing nature of local places, then only we can initiate a more localised action. Since human eye can take a note of these changes most naturally, we need to open the local eye and Visual Narratives can play / need to play a major role in the relocalisation. Our discussion also touched upon the existing research on Visuals in Climate Journalism, the apocalyptic sublime and inefficacy of images like polar beers or smoke stacks.)

Question: You have mentioned that visual narratives with more localised context will be useful to engage the people for initiating effective local action. How do you think the visual narratives be composed, from a journalist's lens?

Answer: As a journalist and as climate change educator, Professor Schaefer highlighted the three key tasks a visual narrator must pay attention to.

Task 1: Relocalisation of our current problems, which also means identifying the local impacts of changing climate and then click pictures. This comes on the background of stock-pictures used by storytellers or narrators that are far from local context and fail to connect with people. (This has been elaborated by Dr. Saffron O'Neills research papers.)

Task 2: Add people to the pictures. 'The Guardian' is very categorical about putting this principle in practice. The climate visuals might be very pleasing aesthetically; however, doesn't make sense and fail to create a connect if they do not feature human figures.

Task 3: We need critical and constructive journalistic narratives. The visual narratives need to find a balance between extreme ends like 'Stories of Disaster' and 'Stories of Hope.'

(*The stories of disaster often intimidate people and leaves them with a sense of having no agency to bring about change. This results in poor participation of no action. The extreme end of the spectrum are the stories of hope, coming from narratives of positive psychology, solution journalism. In words of Dr. Schaefer, these stories paralyse people with positiveness, the stories make people think that a change is possible but it's not too urgent to act. Also, there are other people to act and one may skip joining them. The visual narratives need to be developed to strike a balance between these black or white storytelling*)

Task 4: Challenge the individualisation of our narratives, the individualisation is borne out of neoliberal tendencies and needs to be challenged. The local problems need a collective, localised response.
'What can I do as a single person, to address the problem?'
'Stop being a single person'.
An effective climate visual need to address these 4 principles.
Making the visual communication effective. One needs to understand the limits of communication. Communication alone cannot be effective, unless there are plans, policies and legislations to address the issues. It is definitely true that communication can highlight the issue, which needs to be addressed through a well-devised action. The actors and factors involved in the communication process are important. Citing the example of Darmstadt City in the upper Rhine Valley region, Professor explained that the efficacy of the narrative depends on who the basic communicator is. There are religious and political attributes associated with it. In order to reach out effectively to people, the communicator needs to identify a 'micro-locality' that will be concerned about or be associated with a local problem and there has to be a local communicative strategy for each micro locality. How to identify the micro-locality is crucial and it can be done with the help of 'mind-mapping tools and communicative pillars. Vloggers and Influencers a play an important role in local communicative strategy.

- **Dr. Eleni Myrivilli**
  Global Chief Heat Officer-UN Habitat

Heat is a silent killer and one of the major challenges ahead of European Cities.

- Urban Heat creates number of stresses, shocks, and vulnerabilities for a larger population. We need to communicate the heat stresses to this group more effectively.
- People needs to be a part of solutions, to enhance the Resilience
- The Climate Visuals of Urban Heat Stresses need to include more stories from Pregnant Women and Kids, Laborer's working across Industrial Set Ups, Urban Farmlands, People working on roads (Truck Drivers), streets (street vendors), (parking lots) and Homeless population.
- She further explained how Athens is dealing with heat stresses and how the visuals could play a major role in communication.

- **Dr. Alexandra Borchardt**
  Media Advisor- Hamburg Media School

- Germany belongs to Central Europe and winters are harsh. So, people really look forward to summer months and hence, heat stresses are not very pronounced for younger people.
- Germany is ageing faster and the elderly citizens would find summer months more stressful.
- General level of awareness about urban heat stresses is low
- Usually there is not reliance on images of urban heat stresses. Rather stock images are preferred
- Better mapping of Vulnerabilities arising out of stresses may lead to course correction, better designs and better awareness.

- **Dr. Christel Van Eck**
  Climate Communication Researcher, Amsterdam School of Communication Research

- UHI and Urban Heat Stresses are not known among the audiences
- Elder People and Migrants are highly vulnerable

- Heat Stresses and Public Health Related Research is needed
- We need to have a mixed interaction with different stakeholders

- **Luke Bayer**
  Network Climate Journalism Austria

- Lukas is passionate about researching the impacts of climate change on vulnerable populations, from the lens of economic and psychological vulnerability.
- Heat is a silent killer and even more dangerous for people with psychological illness or physical disabilities. People with mental illness are three times more likely to die during a heatwave, but hardly anyone talks about it. Two women from Athens want to change that. What can Vienna learn from them in dealing with the heat?
- The economic status and affordability decide your ability to adapt to heat stresses. The fuel-poverty leads many more vulnerable to heat stresses, as people cannot afford to buy cooling solutions.
- Relationship between spacial-temporal dimension of urban heat stresses and vulnerability. Who (kinds-women-elderly/ black-white/laborer or officer goer) suffers from the heat in which part of the city at what time, gives better assessment of vulnerability
- How to visualize this or capture in photographs is a major challenge

No.	Field of Expertise	Name , Designation and Work	Major Takeaways of Interaction	Key insight for Photographic Work
1	**Climate Resilience and Sustainability Leadership, Heat Resilience, Climate Action**	**Dr.Eleni Myrivilli** Global Chief Heat Officer -UN Habitat, Europe's First Chief Heat Officer, known for Heat Resilience Interventions in Athens, Greece.	1)Heat is a Silent Killer and a Major Challenge for European Cities 2) We need to identify different layers of Vulnerability to Urban Heat. Groups like Pregnant/Neonatal Women, Kids, Labourers, Farm Workers and Homeless are most vulnerable. 3) Visuals can play a significant role in creating awareness about Heat stresses.	The interaction helped me search for frames specific to women, kids elderly people and labourers, suffering from heat stresses
2	**Media and Communications**	**Dr.Alexandra Borchardt** Media Advisor – Hamburg Media School, Communication Researcher	1)In Germany, General Level of Awareness about Urban Heat Stresses is low 2) In media reports there is no reliance on specific images of urban heat stresses. Rather stock images are preferred 3) Critical mapping of Vulnerabilities arising out of stresses may lead to effective communication designs and better awareness	Inspired a deeper visual analysis of photos used by print and electronic media and understand what could be made differently, to express UHI.
3	**Climate Communication**	**Dr.Christel Van Eck** Climate Communication Researcher, Amsterdam School of Communication Research	1)UHI and Urban Heat Stresses are not known among the audiences 2) A Public Health lens need to be used to communicate about Heat Stresses.	I started thinking more about the moments that express impact of heat on human body.
4	**Climate Journalism**	**Luke Bayer** Network Climate Journalism, Austria	1)Heat is a silent killer and even more dangerous for people with psychological illness or physical disabilities. 2) Relationship between spatial-temporal dimension of urban heat stresses and vulnerability provide crucial connections.	Who suffers from the heat stresses in which part of the city at what time may give better idea about vulnerability. It helped me think about photo-walks on streets with homeless population.
5	**NGO Sector , Journalism and Communication**	**Toralf Staud** Author(Germany 2050-How Climate Change will change our lives), Journalist and Editor – Klimafakten.de	1)In Germany, media reports of heat stress are dominated by reporting of Heat Waves but urban local stresses are not actively reported. 2)The Pleasure-pictures of heat stresses are misleading. 3)We need to sensitize a niche audience like weather reporters, Architects and Doctors about local heat stresses in Cities. 4) We need better and more appropriate visuals for generating mass awareness.	Rather than shaping my visual frames, this interaction helped me analyse my photographs from the perspective of niche audience and develop visual narratives.
6	**Academia, Environmental Journalism and Education**	**Dr.Torsten Schaefer** Network Climate Journalism Germany, Author and Educator, HTW Darmstadt	1)Visual Communication can be effective if Urban Heat Visuals are made more local and more human centric 2)We need more constructive and solution-oriented visuals, drawn from Micro-localities.	The interaction inspired me to photograph the human stories of urban heat in micro-localities like specific neighbourhoods, markets, gardens or streets.

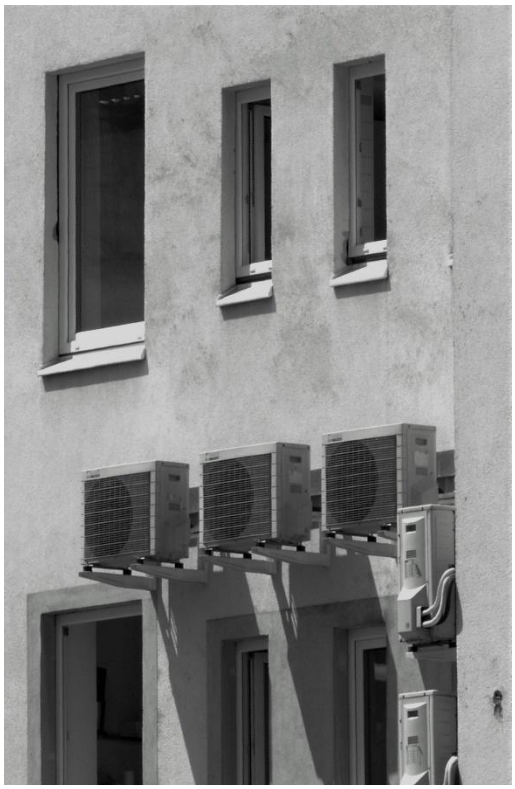
Repository
Urban Heat Stress Visuals

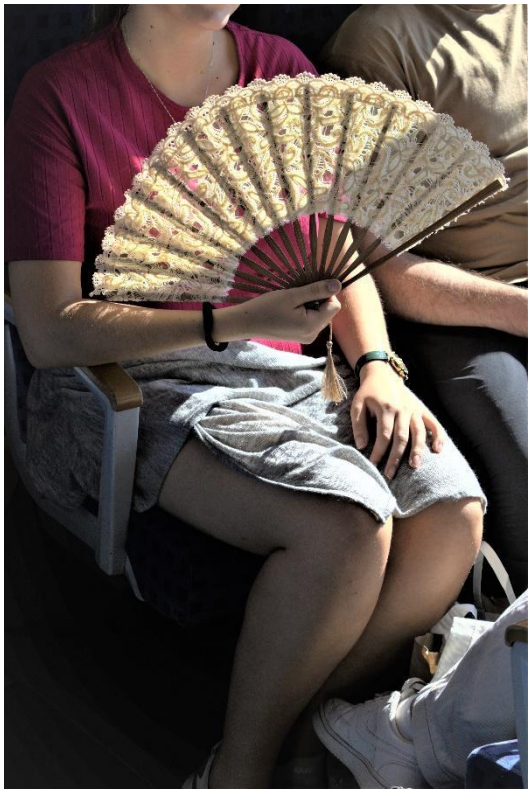
- **<u>Buildings</u>**

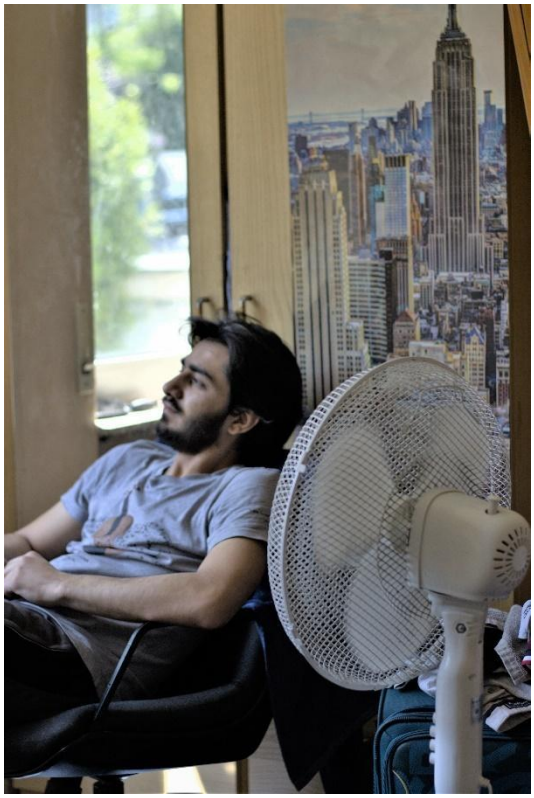




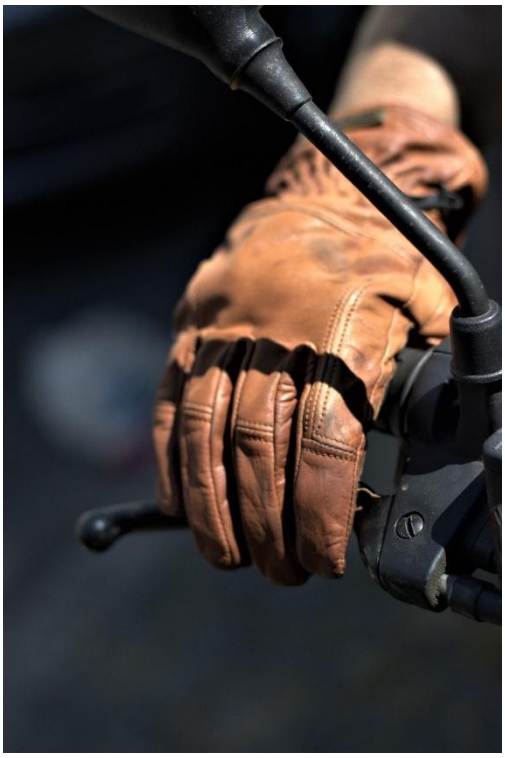
- **Folding Fans, Table Fans and ACs**

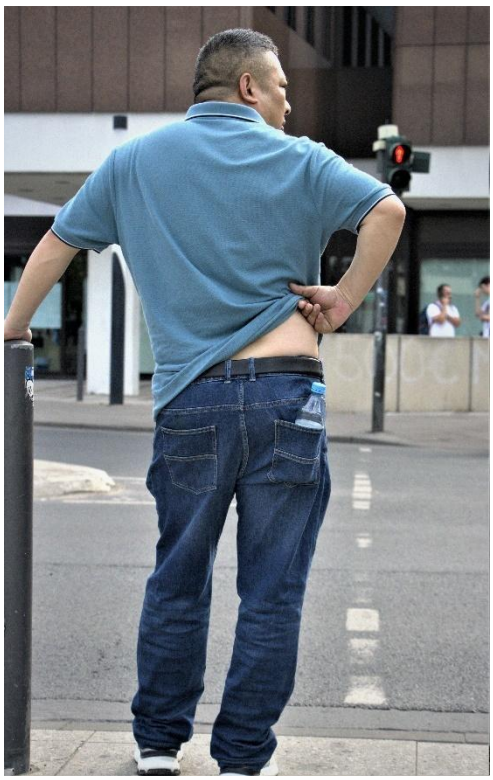






- **Heat _ Exposure to Sun**



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CITY
HOTELS

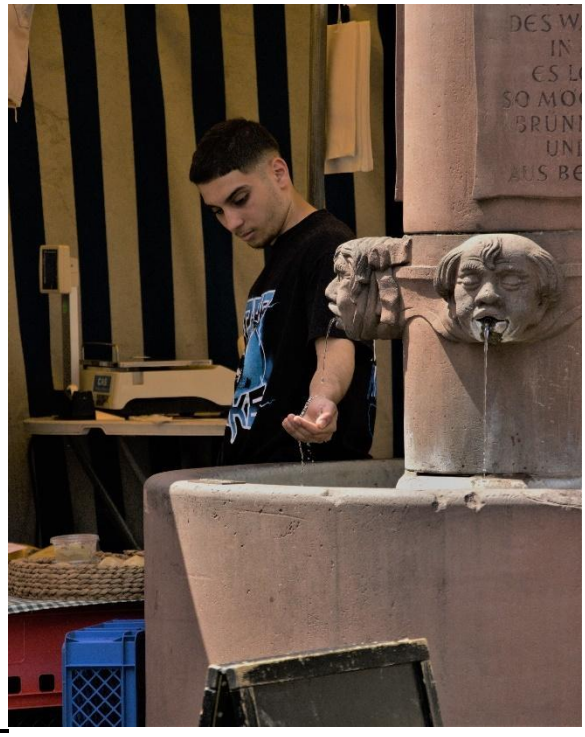

Vorsicht!
S U
S U

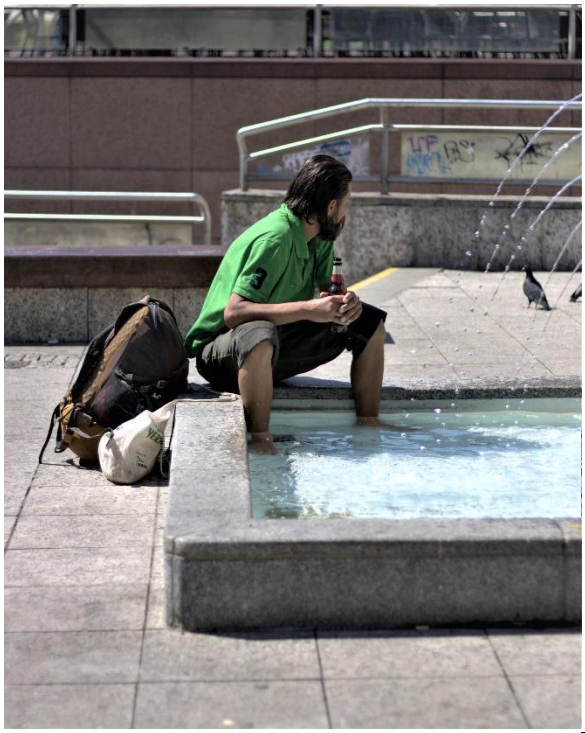

Hauptbahnhof

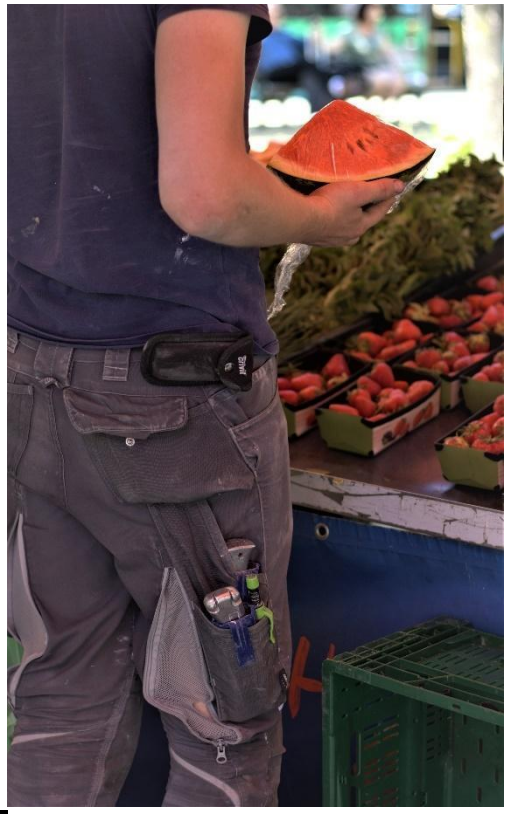
- **Kids _ Parents**

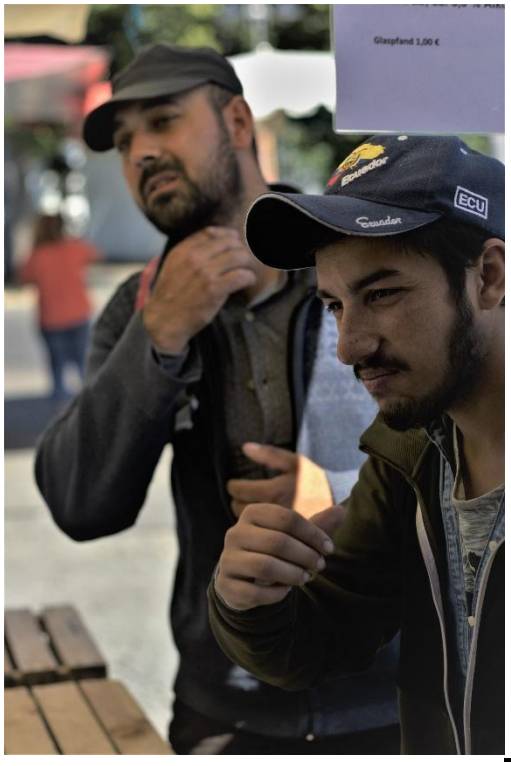

100 m

- **Migrants _ Homeless**





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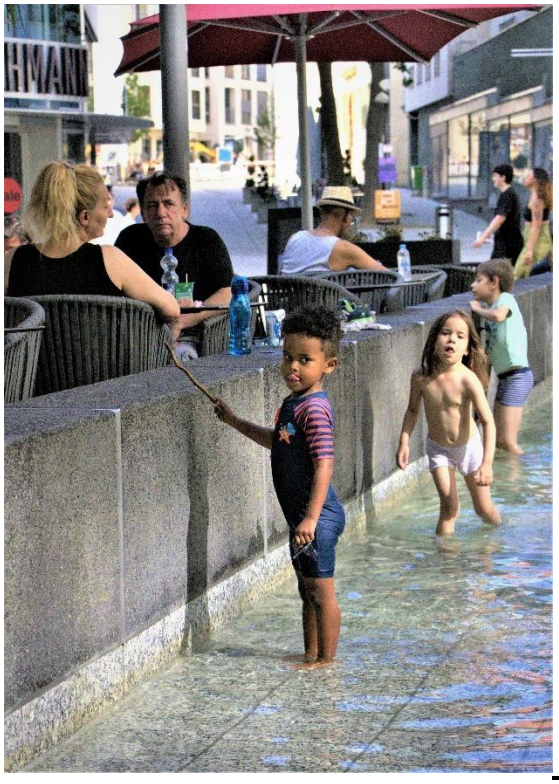
- **Seeking Comfort at Water Places**




sale


JAZZ
& SOUL


mainova
Trinkwasser


THE ART OF
BANKSY
"WITHOUT LIMITS"
UNAUTHORIZED
EXHIBITION
SHOES
no ordinary store
mainova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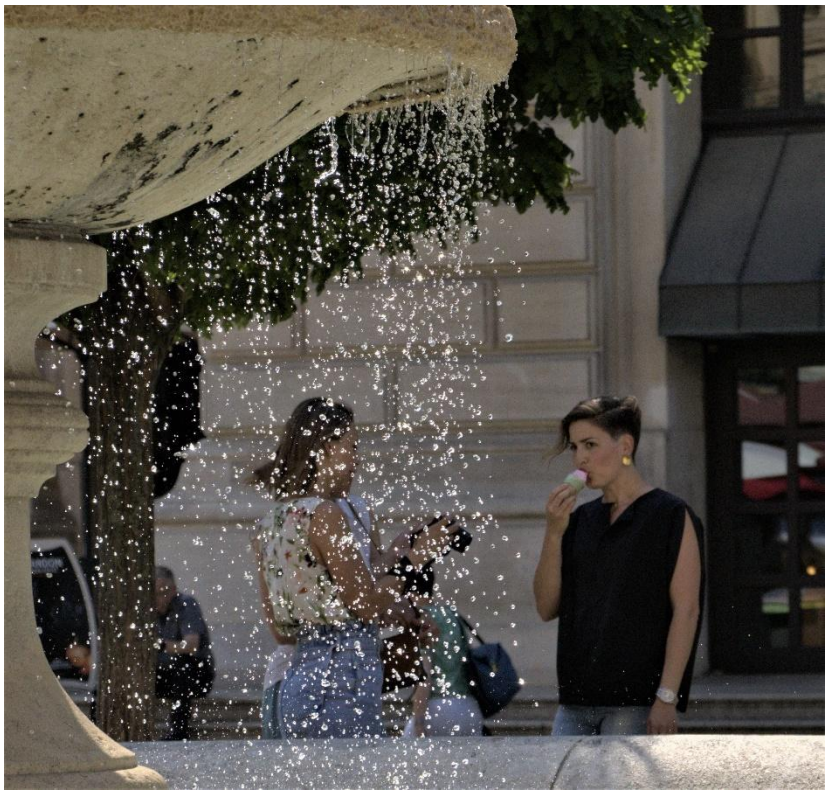

- **Seeking Shade Outdoor**


Radeberger Spezialausschank

- **Watermelon Stories**