



## Climate vulnerability assessment: risks and resilience in Shefa'-Amr

Pre-final report – to be updated with feedback from municipality employees and community













#### About

This vulnerability assessment was prepared as part of the project "Harnessing expertise and local knowledge for the development of climate resilience in the city of Shefa-'Amr", led by The Galilee Society in partnership with the University of Haifa and the municipality of Shefa-'Amr.

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### Contents

Executive summary
Background4
Climate change policy4
Climate risk assessment
Urban profile: Shefa-'Amr7
Research methods
1 – Resident survey
2 – Focus groups and feedback groups
3 – Key informant interviews
4 – Quantitative data collection and spatial mapping14
Residents' perceptions of existing local climate impacts15
Perceptions regarding extreme heat15
Perceptions regarding winter storms, rain and floods18
Climate hazards
Exposure to climate hazards27
Exposure to heat and extreme heat
Exposure to risk of forest fires
Exposure to flooding
Vulnerability – sensitivity and adaptive capacity
Demographic data related to sensitivity and adaptive capacity
Sensitivity to heat-related risks
Economic sensitivity to heat-related risks
Physical and health-related sensitivity to heat-related risks
Sensitivity to precipitation-related risks
Individual sensitivity to precipitation-related risks
Economic sensitivity to precipitation at the municipality level
Economic sensitivity in agriculture
Adaptive capacity
Financial capital
Institutional capacity / governance
Infrastructure and technology capacity90
Human capital108
Social capital 116
Natural/environmental capacity 122
Conclusion



## **Executive summary**

<mark>To add</mark>



## Background

## **Climate change policy**

Climate change policies fall within two main domains: mitigation and adaptation. When talking about what should be done to address the climate change crisis, many people think of "mitigation": measures to decrease greenhouse gas emissions, and in this way reduce the phenomenon of climate change and its hazards.

However, we know that climate change is already present (see the "Hazards" section), causing extreme events and longterm changes, and harming health, wellbeing and the economy. Unfortunately, at the global level the changes of overturning the current climate change trends are currently slim. Therefore we can expect our lives and the lives of our children and grandchildren to be affected by climate change.

In this context, there is an additional way to address the climate change crisis: "preparedness" or "adaptation". This approach suggests that countries, cities and people need not only reduce greenhouse gas emissions, but also adapt and prepare themselves for climate change, to reduce risks and increase opportunities to improve the economy, society and wellbeing.

In Israel, several cities have started working on climate change preparedness

**plans and implementation**. The Municipality of Tel Aviv-Yafo was the first to publish an action plan in 2020; and in between 2021 and 2023 a number of local authorities secured budgets that included the elaboration of a preparedness plan.



Figure 1 - Climate change mitigation and adaptation

Shefa-'Amr will be the first Arab local authority in Israel to adopt a climate change preparedness plan, as part of the project "Harnessing local expertise and knowledge for the development of climate resilience in the city of Shefa-'Amr", led by The Galilee Society in partnership with the Municipality of Shefa-'Amr and the University of Haifa, and funded by the European Union and the MISEREOR foundation.



## **Climate risk assessment**

To define which preparedness measures should be prioritized, one needs to understand what risks exist at the local level. This report presents an assessment of the economic, health and wellbeing climate-related risks to the residents of Shefa-'Amr, and their related factors.

The study used the framework of the IPCC (the United Nations Intergovernmental Panel on Climate Change), which includes 3 main domains.<sup>1</sup>

- Climate-related hazards
- Exposure to hazards
- Vulnerability to hazards

"Hazards" are the climate-related phenomena which exist in the region, such as drought or sea-level rise.

**"Exposure"** assesses how the natural and built environment exposes us more or less to hazards – for example people in areas with many trees may be less exposed to heat.

"Vulnerability" is the tendency to be adversely affected (that is, to be harmed

by a hazard), related to physical and economic sensitivity factors as well as adaptive capacity. This study aimed to identify strengths, and not only focus on weaknesses, in order to enable future preparedness plans that take advantage of and further develop existing strengths.



Figure 2 - Climate risk framework (adapted from IPCC)



## **Urban profile: Shefa-'Amr**

Note: In addition to this brief overview, information relevant to climate risks is included in various sections of this report, for example demographics (see 'Demographic data related to sensitivity and adaptive capacity'), runoff water management and drainage (see 'Infrastructural capacity', 'Institutional capacity'), health services (Section 'Infrastructural capacity'), public spaces ('Infrastructural capacity'), etc.

**Shefa-'Amr has a long history**, having been inhabited from the Bronze Age and continuously inhabited since the Roman period. There are several historical sites in the city. During the Ottoman rule, Shefa-'Amr was a center of activity and services for 22 villages in the area.<sup>2</sup> As such, it received the status of a city in 1906 and a city council in 1910, despite its relatively small population (2,750 inhabitants in 1877), and mostly agricultural livelihood at the time.

Table 1 - Geography and climate

Municipal territory	Landscape	Mediterranean climate
19.58 km²/ 22 dunam		
2013 land use	Main rivers/streams	Temperature
66.4% Built-up	Wadi El-Saqia (Nahal Shefaram)	Maximum 2021: 39.7 °C
Incl. 25.8% Residential	Wadi Abu 'Afan (Nahal Hanaton)	Minimum 2021: 3.1 °C
24.5% Agriculture 9.1%	Wadi El-Fawar (Nahal Shafron)	
Forest and wood grove	Note: classified as 'secondary drainage channels'	
Elevation	Forest/woods	Precipitation
Average: 137 m	'Shefa-'Amr forest' - large part,	2021: 607.8 mm
Min-Max: 35 – 310 m (50 –	planted by JNF/KKL in 1959/60	
205 m in built-up area)	and 1980s	Köppen-Geiger climate
	'Kiryat Ata Forest' - small parts	classification: "Csa - Temperate
Said to be "built upon 7 hills"	#204 and #202, planted by	with hot, dry summer"
	JNF/KKL in 1993	

Sources: municipal territory, land use, average elevation – CBS<sup>3,4</sup>, climate - IMS<sup>5</sup>, elevation - GOVMAP<sup>6</sup>, forest – JNF/KKL<sup>7</sup>

**Shefa-'Amr is located between Acre, Haifa and Nazareth, about 20 km from each.** Its central location contributed to its development, for example during the time of the Crusades. The "Nazareth-Acre" road passed through the center of the city until the construction of highway 79 in 1975. Highway 79 now runs south of most of the built-up area. This location means the city is close to employment centers in the nearby larger cities, and to services such as hospitals in Haifa and Nazareth. A train station is planned in the south of the city as part of the future Haifa-Nazareth light rail train (target date of 2027).



Picture 1 - North view from Zahir El-Umar fort (photography: Alix Pahaut)





Figure 3 – Topography and built environment maps of Shefa-'Amr municipal territory, source: GOVMAP



Рори	lation	CBS Indicators	Education facilities
<b>1887:</b> 2,750	Gender	Socio-economic	<u>K-12</u>
<b>1955:</b> 5,400	50% male/female	(2017)	84 kindergartens
<b>2021:</b> 43,023		3	15 elementary schools
	Religions	(1-10), ranked 66 out	5 middle schools
Annual growth	61% Muslim	of 255 localities	10 high schools
2011-2021: +14%	25% Christian		
	14% Druze	Compactness (2018)	Post-secondary
2050 simple estimate		6	Several private
(with 14% annual		(1-10), ranked 133 out	professional and
grown <sup>i</sup> ): 62,979		of 197 localities	technical colleges
	More demographic		
Total population in	data: 'Demographic	Peripherality (2015)	
master outline plan:	data relevant to	5	Medical facilities data:
96,400	sensitivity and	(1-10), ranked 142 out	'Infrastructural
	adaptive capacity'	of 255 localities	Capacity'
Courses: CDC ALLIS <sup>28</sup>	1		

Table 2 - Population and indicators

Sources: CBS, Al-Haj<sup>2,8</sup>

**Shefa-'Amr is in socio-economic cluster 3 out of 10**, similar to other Arab localities in the center and north, most of which are in clusters 2-3. As characteristic to Arab localities in Israel, Shefa-'Amr faces significant urban planning challenges, as a result of decades of decades of imposted 'regulatory' planning not suited to the local context.<sup>i,ii</sup> However, the approval of a Master Plan in 2021 has set the basis for planning enhancements in the coming years.

At the same time, Shefa-'Amr is also considered as a high development potential locality. While the locality has been described as being at the "seam between a village and a city", it is the fifth largest Arab locality in terms of population, but with less population density per builtup residential area than Nazareth, Umm al-Fahm, Tayibe, Tamra and Sakhnin (as of 2013).<sup>9</sup> There is also more land on which to build compared to Nazareth. In this context, despite the tradition in Arab society in Israel to live in the husband's hometown, the lack of space in localities like Nazareth has driven many families to move to places like Haifa, Nof HaGalil, as well as Shefa-'Amr.

The commercial-economic development that has taken place in recent years should be noted (see the contrast between the quotes from 2013 and 2022).<sup>10</sup> This trend is expected to continue with the development of the eastern industrial and employment area according to the Tamal/1036 plan. However, commercial development is not the same as the development of urban infrastructure and services for citizens.

In this domain, a number of projects related to urban infrastructure have taken place in recent years and more are ongoing. For example: the completed construction of more than

<sup>&</sup>lt;sup>1</sup>14% assumes population growth similar to the previous decade, which is mainly based on growth with no immigration. For planning purposes, it may be useful to estimate the population growth in a more ambitious way, if the goal is to develop the city as one of the leading (Arab) cities in the region. A report from 2012 indicates that planning in Jewish communities is often "entrepreneurial planning" that counts on growth from immigration from abroad and from within the country beyond natural growth, compared to "regulatory and restrictive planning" that is used in many Arab communities.<sup>132</sup>

<sup>&</sup>lt;sup>II</sup> Prof. Rassem Khamaisi describes the process that Arab localities in Israel such as Shefa-'Amr have gone through as "false and latent urbanization" or "urbanization without urbanism" and calls the localities "urban villages", according to the explanation that despite the process of population growth and changing livelihoods, the population has maintained a relatively traditional 'rural' culture and experienced limited migration.<sup>133,134</sup>



10 playgrounds and sports fields; the "Change Authorities" transportation plan including bike paths, more bus stops and enhanced walkability; a station for the future light rail train; the TAMAL/1036 development plan for the east of the city; an approved plan for a swimming pool complex, etc. Of course, it takes time to implement plans, and there are sometimes also significant barriers. For example, problems related to obtaining approval for a sewer line have slowed down the issuance of building permits.<sup>11</sup>

**All in all, Shefa-'Amr can be seen as a locality "in transition"**. For decades, it has been experiencing multi-dimensional change processes, which are more complex than single-dimensional scales such as traditional-modern or village-city. Questions for the future include: in what way and at what pace will the social and physical changes continue?

"Shefa-'Amr is today on the "seam" between a village and a city. Its rural characteristics are reflected, among other things, in sparse construction, a lack of infrastructure, and the limited willingness of private land owners to set aside land for public needs. The "urban" characteristics are reflected in the ongoing positive migration trend of a young population, a relatively high percentage of rented housing, and in the trend of mixed uses along main axes." (Master Plan, Plan Instructions 2015)

"Very few restaurants, clothing stores and shoe stores. This means that residents are currently forced to do most of their shopping for ... products and white goods outside the city" (Master Plan, Socio-Economic Appendix 2013)

"In recent years [Shefa-'Amr] has enjoyed an economic boom, and the western entrance of the city has become a large commercial complex, with dozens of shops and branches of commercial chains." (Zoevi 2022)

Quotes 1 - On Shefa-'Amr's partially urban character

Sources: Master Plan<sup>9</sup>, Zoevi 2022<sup>12</sup>

بناء القدرات المحلية للصّمود أمام

التــف



Figure 4 – Statistical areas according to the CBS, neighborhoods according to GOVMAP (in black: more locally recognizable neighborhood names)

rable of otationed and population density									
Statistical	Population	Density	Statistical	Population	Density				
area	(2008 census)	(thousands/ km <sup>2</sup> )	area	(2008 census)	(thousands/ km <sup>2</sup> )				
1	6100	1.4	6	2300	4.2				
2	4900	4.9	7	4100	10.8				
3	2000	1.6	8	4100	2.4				
4	4100	1.4	9	3600	4.3				
5	2500	1.6	10	2000	0.6				

Table 3 - Statistical areas and population density



## **Research methods**

#### Main research questions<sup>iii</sup>

- What are the climate hazards in Shefa-'Amr?
- What are the risk factors for the residents of Shefa-'Amr from climate change especially factors of exposure and vulnerability (including sensitivity and adaptive capacity)?
- Which places and/or populations are more and less exposed to climate hazards?
- Which places and/or populations are more and less vulnerable to climate hazards including sensitivity and adaptive capacity?
- Which forms of capital are strong and which ones are lacking as relevant to adaptive capacity (financial capital, institutional/political capital, infrastructure and technological capital, human capital, social capital, environmental/ natural capital), what mechanisms impact current forms of capital?
- What are existing strengths in Shefa-'Amr in terms of exposure (existing protection from hazards) and vulnerability (existing adaptation and adaptive capacity)?

## 1 – Resident survey

**Distribution**: online via (sponsored) social media, as well as in printed form among the residents of Shefa-'Amr

Distribution dates: August 8 – October 6, 2021

Respondents: 482 (representative number compared to population size)

- The respondents represent the different religions in Shefa-'Amr: Muslims 54%, Christians 27%, Druze 11%
- More women: 58.3%
- Higher than average education

## 2 – Focus groups and feedback groups

Focus groups: 91 participants in 21 groups, sessions lasting 45-90 minutes

Feedback groups: 37 participants in 5 groups, sessions lasting 60-90 minutes

	Focus groups 1	Feedback groups 1	Focus groups 2	Feedback groups 2
Groups	9	5	7	1
Participants	52	37	36	4
Dates	February – May	July – August 2022	August –	March 2023 - TBC
	2022		November 2022	
Types of participants	Active volunteers, older men and women, men who work outdoors (gardening and	Active volunteers, older women, people who work outdoors,	Young adults, Bedouin (mixed and women), people involved in agriculture,	People involved in agriculture

<sup>&</sup>lt;sup>iii</sup> The study does not include risks to the ecological/environmental ecosystem in the Shefa-'Amr region. Ecological risks can also affect residents.



cleaning), Druze	municipality	mothers of adult	
women	employees	children with	
		disabilities	

Focus groups demographic description (not including feedback groups):

- The respondents represent the different religions in Shefa-'Amr
- 55% women, 45% men
- Neighborhoods: Abu Shhab, Ein 'Afia, Ajrush, Al Karak, Osman, Almidan, Wadi Alhamam, Suftadi, Alakhdar, Alfawar, Elain, Jabata, Released soldiers, Marashun, The old city (Bab Aldir, Alqala, Alhawra), Alburj, Wadi Alsaqia, Zahar Alkanis, Almutala, Alkharubia – and also a few participants from 'Abilin

## **3** – Key informant interviews

Name	Role
Omar Malek	Municipality, CEO
Jeris Hana	Municipality, Deputy
	Mayor
Hani lariura	Municipality, Resource
	Development
Avi Tayyar	Municipality, Head of
	'Shefa' (beautification)
Eng. Maha	Municipality, Deputy Head
Hamudi	Engineering
Farid Hacun	Municipality
Fand Hasun	Infrastructure Manager
Wassoom Hai	Municipality Head of Early
wasseeminaj	Childhood Center
Karem Sobeh	Municipality, Head of
	Sports
Safaa Hamada	Municipality, Head of
Taha	'Optimal Aging' Project
Farid Shaheen	Municipality, Head of
	Welfare
Badiaa Khanifes	Municipality Advisor
Daulaa Kilaililes	Advancement of Women
	Advancement of Women
Hind Khatib	Municipality 'cadet',
	Economic Development
Yasser Hassan	Municipality 'cadet',
	'Shefa' (beautification)
Itamar Gizelman	Municipality 'cadet', CEO
	Assistant

Name	Role					
Ali Ayub	Resident, Head of					
	Muslim Scouts					
	Organization					
Raja Saad	Resident, Former Head					
	of Shefa-'Amr					
	Agricultural Committee					
Maysa Shaban	Community Center, Head					
Haj Ali	of Community					
	Department					
Elay Koren	Hamifrats Regional					
	Cluster, Director of					
	Sustainability					
Brook Totari	Hamifrats Regional					
	Cluster, Local					
	government 'cadet'					
Haim Hemi	Kishon Drainage					
	Authority, Head					
Eng. Uri Regev	Kishon Drainage					
	Authority, Head Engineer					
Eng. Amit Koltin	Water engineer					
Prof. Itay Beeri	University of Haifa,					
	Associate Professor Local					
	Government					
Prof. Naomi	Technion, Professor of					
Carmon	Urban Planning and					
	Sociology					
Prof. Rassem	University of Haifa,					
Khamaisi	Professor Urban and					
	Regional Planning					



## 4 – Quantitative data collection and spatial mapping

#### Publicly accessible data

See 'Data Sources for Climate Vulnerability Assessment' online Excel file, which lists 47 different indicators/datasets which were used as part of this assessment.

MISEREOR	Funded by the Euro	יות מקומיות סיים Union	<b>ינוי אקלים ברשו</b> וח חוסן אקלימי בעיר שסרע	רכת פגיעות לשי ז מומחיות וידע מקומי לסיתו	<b>להכנת הע</b> י פרויקט "רתימו	<b>מקורות נתונים ו</b> פורסם ע			Son Dorbursk Universite of Balls	A STATE OF STATE	Linge I Agents The define the leader The define the leader The define the leader The define the leader
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הערות	מידע נוסף	מקור הנתונים	שנה	מקור	כלי נדרש	עיבוד מומלץ	קצב עדכונים הנתונים	רוזולוציה הנתונים	תיאור נתונים	דל נתונים	קוד מד
				נתוני רקע							
	<u>ס"שור לעד אכבות GIS מרלמ"ס</u>	קובץ השכבה הארגית של האזורים הסטטיסטיים ממפעד 2008	2008	fa'o	GIS	להשתמש בשנבה הנכונה לפי הנתונים "הנתומים ממפקד 2022 עדייו לא פורסמו	כל מפקד האוכלוסין	8100000 B118	השכבות הארצית של האזורים הסטייסטים ממפקרי האוכלוסין 2008 2002	B*00/00	A1 אזורים סט
		<u>שכבת אזורים ספטיסטיים 2022 + מקור נוסף</u>									
	GOVMAP פישור לחוברת הדרכה	https://www.govmap.gov.il/ ב"שכבות" לבחור "שכונות"	לא ידוע	GOVMAP מקור: המרכז למיפי ישראל	Чорм / GIS	(1) אקסל: לרשום את השכונות באקסל לשימוש עתידי (לדוגמה לסקר תושבים). אפשר לרשום ביחד עם השם: האם השם		nabe	שכבת גבולות שכומת ברמה ארצית		A2 שכונות
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						GIS (2): אין אפשרות להוריד את הפוליגורמ. יש ליימר אותם שכונות מחדש בGIS					
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				חשיפה לחום							
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		<u>מארר נתורס ממארחלרים</u> / <sup>עובר בללי ב<del>ייי בע</del>ב</sup>	2023	השירות המפאורולוגי הישראלי	אקסל	ראו דוומה בס <u>ום הקובי</u> (1) במאגר לביות המוז מין (לדוגמה 10 במאגר לבישוב, לבחור התחמה הקרובה ביתר ליישוב, לבחור "מספרוסורת מקסימום", להוריד את קובץ האקסל, באקסל לחטוב מספר ימים פועל 34°C לכל שנה	'04'	לפי תחנות מסארולוגיות	מספר ימים מעל 34°C לכל שנה	pute onega	0 סמפרטוה 82
						(2) להשות את התחזית ממדד B1 ראו דוגמה בסוף הקובצ					
הגרסה הנוכחית עדיין לא אומתה.	אפטר גם לבדוק את <u>מיפי שמט הום ממוצע</u> 2020-2011 / ושכבת "עומס חום ביצור וכבד באונוספ" בקפוזועספ, זה לא אותו מדד ואין רזולוציה ברמה	הרשות המקומית יכולה לבקש גישה מוקדמת לפורטאל מהמדעית הראשית של המשרד להגנה הסביבה, אפילו אם הוא עדיין לא נגיש לציבור.	לא ידוע	המשרד להגנה הסביבה	гетеј	לזהות אזורים יחסית חמים וקרים	עדין לא זמין לציבור	מטר 30°30	שכבת אי החום העירוני היא תרחיש מחושב לאוגוסט בשעה 21:00. המפה מציגה אזורים הנקראים איי חום	רוני (פורטאל חדש ד להגנה הסביבה)	אי חום עיז של המשר

Note that the most recent source of data available by statistical area is the 2008 Population Census. Numbers may have changed significantly in the past 14 years. <u>It is therefore recommended to update the data once the 2022 Population Census data will be available.</u>

Source	Data description
Municipality GIS	GIS datasets: roads, public facilities and institutions
department	
Dr. Shafran-Nathan and	Summer heat index Shefa-'Amr (decades 80s, 90s, 00s, 10s;
Prof. David Broday,	and years 2020, 2021) <sup>13</sup>
Technion	
Project urban field data	Survey of leisure/sports public spaces in Shefa-'Amr
collection	(playgrounds, sports fields, parks, outdoor gyms) <sup>14</sup>
GIS mapping by Guy	Walkability mapping based on intersections density;
Steenekamp	mapping of street slopes; mapping of walking distance
	access to leisure/sports public spaces
Israel Electricity Company	Freedom of information request regarding the number of
	prepaid electricity meters in Shefa-'Amr <sup>15</sup>

#### Non-publicly accessible data



# Residents' perceptions of existing local climate impacts

Most cities in Israel are not adapted to the Mediterranean climate. Due to climate change, events like summer heat waves and winter storms are becoming more extreme, and the summer season is becoming prolonged - trends that will intensify in the coming years. This chapter presents the existing experience of the city's residents regarding extreme climate. In the following chapters, the factors related to these climate impacts as well as future risks will be presented.



Figure 5 - Shefa-'Amr residents survey 2021 (482 respondents)

### Perceptions regarding extreme heat

Already today there is a significant impact from very hot days on the residents. The city is not adapted to the existing level of heat, and is a source of challenges, including health, welfare and economic impacts. At the same time, people are used to the challenges associated with heat and use different coping strategies.

There was a repeated negative description of very hot days: fatigue, struggle, suffering, weakness, laziness, stress, suffocation. There were also participants who said that heat "doesn't bother me" or that they like the summer, but much less compared to the negative descriptions. The impact that seems to be the most serious and widespread is the effect on well-being and health. In focus groups, many examples of health impacts were mentioned, including physical health (heat strokes, fainting, headache, skin and eye problems, allergy triggers) and mental health (difficulty resting, depression).



Apart from direct health effects, the description of behaviors on very hot days such as staying indoors/in air-conditioned places, and the need to rest, suggests that overall there may be less physical activity and less socializing. Although for the latter, this may be balanced out by more evening socializing. Lack of physical activity may harm physical and mental health. Lack of social connection may harm mental health, perhaps especially for people who do not work (such as housewives, pensioners, children during summer vacation, disabled people who are unemployed, etc.). At the same time, summer is also emphasized as a time for fun such as going to the beach, having barbecues, and being the stage for the wedding season.

It seems that the economic impacts affect certain population groups more than

others. First, the participants talked about the cost of air conditioner (electricity), which is especially burdensome for people in difficult financial situations. Second, there were some stories related to cutting back hours of work for people who work outdoors or without air conditioning, to avoid too much exposure to heat.

Heat also affects agriculture. For example, farmers said that today they have to use moisture-retaining nylon to grow certain vegetables. Nowadays only few people depend on agriculture as their primary source of income, however there are others who grow vegetables and fruit for private consumption and secondary income, including olives which also have cultural value.

#### *Focus group participants – impacts of heat*

"In the summer season, I sleep all the time, because I'm tired all the time."

"When the weather is normal, we are more likely to be more relaxed, but when it's hot we are not in the mood to talk to the husband, the kids - it impacts our mood."

"In such high heat, I can't stand it, because I have headaches, and I have low blood pressure, and that really bothers me, the heat."

"[Heat] bothers me, it bothers me. When you are a young woman age 20 or 30, you don't get bothered, but once you are 40,45, it's more difficult"

"Without A/C we can't handle it. The whole time the A/C is on and it has a cost."

"We have been dealing with the heat for many years."

Quotes 2 - Impacts of heat, focus group participants

#### 2021 residents' survey results mapping - impacts of heat

Note: For the survey results, 10 neighborhoods were not included as they have very few/no residents. The remaining neighborhoods were combined into 17 areas.





35°8'30"E 35°9'E 35°10"E 35°10'E 35°11'8 35°11'30"E 35°11'30"E 35°11'30"E Figure 6 - Percent who answered they have experienced "some" or "severe" negative health impacts from extreme heat. Shefa-'Amr residents survey 2021, 438 respondents



*Figure 7 - Percent who answered they have experienced "some" or "severe" negative financial impacts from extreme heat. Shefa-'Amr residents survey 2021, 482 respondents* 





Figure 8 - Percent who answered they have experienced "some" or "severe" other negative impacts from extreme heat. Shefa-'Amr residents survey 2021, 482 respondents

## Perceptions regarding winter storms, rain and floods

Similarly to the case of heat, there is also an impact from storms and heavy rain on the residents of Shefa-'Amr. Annually there are cases of street flooding and sewage water overflow, and there have also been cases of water flooding houses and yards. From a traditional perspective, rain is considered a blessing, but residents also associate rain with flooding and damage.

There was a two-sided description of rainy days: blessing, refreshing, but also flooding, damage and a feeling of dirtiness. This latter feeling is related to the combination of water and garbage in the street.

There are short-lived floods every year in the winter - mainly in the streets, but there are also cases of flooding in yards or individual houses. Most of the time the damages from floods are relatively modest, such as potholes or sewage overflows in the street, or leaks in the house. Nevertheless, there have been some more serious cases, such as the collapse of a street in the Al-Midan neighborhood in 2018, as well as a couple cases of cars that were stuck with passengers in danger of drowning. It seems that even the less serious cases damage the trust of the residents in institutions like the municipality - perhaps less because of the level of damage, and more because of



frustration from the ongoing recurrence in the exposed areas.

Residents also talked about the risks of driving in the rain, such as the risks of a car accident, as well as the risks of car damage due to (flooded) potholes.

Most of the areas that have experienced flooding are located along the streambeds such as Wadi Al-Saqi'a (Nahal Shefa-'Amr), Wadi Abu 'Afen (Nahal Hanaton) and their confluence in El-Ein but there have also been cases in other areas due to problematic sloping of new or renewed street asphalt, as well as due to sewage overflow. On the social side, many people avoid going out for activities in the rain, somewhat similarly to periods of high heat. Perhaps the difference is that heavy rain in winter usually lasts a shorter time than high heat in summer.

In addition to runoff management challenges (including drainage infrastructure), the lack of rain protection at bus stops was also mentioned.

Of course, rain patterns also affect agriculture. Heavy rain damages outdoor vegetable crops, and rain that comes too early or too late can also damage crop yields.

#### Focus group participant quotes – impacts of rain

"[When it rains in an area that is littered with garbage] instead of a refreshing feeling, it gives a bad feeling. There should be a good smell with rain, instead it's disgusting."

"They turned the wadi into a street, and when the water gets high when there's heavy rain, the street gets blocked, it's hard for the car to pass. It happens every year. ... In a few hours it passes."

"There is no drainage in the neighborhood. ... Every time it rains we close the house entrance with stones so that the water will go in a different direction and won't enter the house. It's just like in the Middle Ages."

"In my opinion [a rainy day is] a normal day but we must be careful with regards to accidents, keep more distance between the cars, especially when it's the first rain"

"During this season [March 2022], whoever grew beans and spinach, the rain hurt the crops. Too much cold hurts agriculture and no rain at all is not good either."

Quotes 3 - Impacts of rain, focus group participants

#### 2021 residents' survey results mapping – impacts of strong rain/floods

Note: For the survey results, 10 neighborhoods were not included as they have very few/no residents. The remaining neighborhoods were combined into 17 areas.





*Figure9 - Percent who answered they have experienced "some" or "severe" negative health impacts from strong rain/floods. Shefa-'Amr residents survey 2021, 482 respondents* 



*Figure 10 - Percent who answered they have experienced "some" or "severe" negative financial impacts from strong rain/floods. Shefa-'Amr residents survey 2021, 482 respondents* 





Figure 11 - Percent who answered they have experienced "some" or "severe" other negative impacts from strong rain/floods. Shefa-'Amr residents survey 2021, 482 respondents



## **Climate hazards**

#### Brief national summary of climate change forecasts

Climate data forecast in Israel from present until the end of the century (2071 - 2100)<sup>16</sup>

- Up to 4.4°C average temperature rise
  - This is in addition to an increase of 4°C on average compared to 1950 that has already taken place
- Up to 60% of the days per year could be "hot days" (longer than 7 months)
- Up to 25% reduction of the total annual rainfall
  - However, see below in the Galilee, an increase in the total annual precipitation is expected until 2050, then a decrease
- A small increase in extreme rainy days
- Large variation in drought conditions from year to year

#### Rain 1975 – 2020, by region

In the Galilee between 1975 and 2000 there was "a decrease in the number of rainy days and an increase in the average amount (intensity) of the water, resulting in the absence of a clear trend regarding the total amount of rain".<sup>17</sup>



Figure 12 - Changing trends in the rainfall regime in Israel over the years 1975 – 2020

Source: Ziv et. al 2021<sup>17</sup>



#### Rain forecast 2021-2071 compared to 1988-2017, by region

In the Galilee a slight increase in rainfall is expected on average until 2050 under both scenarios RCP 4.5 and 8.5, after which a decrease is expected under both scenarios as well.



## איור 4. השינויים החזויים במשקעים בשנה ממוצעת (באחוזים) בכל אגן, ביחס לתקופה 1988 - 1988 איור 4. השינויים החזויים במשקעים בשנה ממוצעת (באחוזים) בכל אגן, ביחס לתקופה לשלוש מעונים עבור 2015, בחלוקה לשלוש תתי-תקופות: 2002-2011, בסגר 2000 ו- 2001-2011.

Figure 13 - Predicted changes in precipitation in an average year (in percentages) for each basin, relative to the period 1988-2017. Top panel for scenario RCP 4.5, bottom panel for scenario RCP 8.5, split in 3 sub-periods: 2021-2050, 2051-2080, and 2071-2100

Source: IMS report<sup>18</sup>



#### Days above 34°C forecast 2006 - 2050 compared to 1961 - 2005, by region:

Shefa-'Amr is located on the edge between two regions. In the coastal region, a 100% increase in the number of hot days is forecasted, from 9.5 to 19 days per year. In the Lower Galilee region, a 136% increase is forecasted, from 31.6 to 74.6 very hot days per year.



איור 1#: תחזית לעלייה במספר ימי השרב (מקור: שירות מטאורולוגי)

Figure 14 - Forecasted increase in very hot days. Top number is number of days per year in 1961 – 2005 period, bottom number in parentheses is forecasted number of days per year for 2006 – 2050 period

Source: IMS data presented within Open Landscape Institute report<sup>19</sup>



#### Local climate risks

Considering the hazards mentioned above, a variety of risks are possible to consider related to extreme events as well as longer term impacts. Figure 15 provides some concrete examples to illustrate the broad range of health, wellbeing, social and economic possible impacts considering the expected local climate change phenomena.



Figure 15 - Possible risks based on expected local climate change phenomena

**The diagram shows only one level of risks** - risks may have more interactions and impacts. For example, the collapse of a tree branch or a forest fire can both damage a car (financial impact) or injure a person (health impact). Heat-related morbidity has various pathways including direct impacts of heat like heat stroke and dehydration, and longer-term, indirect impacts such as impacts on physical activity or impacts of chronic dehydration (see 'Sensitivity' section).

**International risks related to climate change in different regions should also be noted**. At the international level, climate change has an impact on the food system, for example, and also to a certain extent on migration, displacement and conflicts. These domains can also affect Israel and Shefa-'Amr, for example affecting the economy or regional security.

This report focuses on risks related to heat and precipitation - and as mentioned earlier, the study does not include risks to the environmental/ecological ecosystem.

Wider national and regional risk mapping can be found in several reports: Israel climate change preparedness report no.1 (2021), the WHO climate and health Israel profile (2022) MedECC's first Mediterranean assessment report (2020) and the IPCC's observed impacts of climate change on human systems in the Mediterranean and overview of key risks in the Mediterranean.<sup>16,20–23</sup>



#### Are there positive impacts from climate change?

"Yes, there will probably be some short-term and long-term benefits from global warming. For example, the flip side of increased mortality from heat waves may be decreased mortality from cold waves.

In the short term, farmers in some regions may benefit from the earlier onset of spring and from a longer warm season that is suitable for growing crops. Also, studies show that, up to a certain point, crops and other plants grow better in the presence of higher carbon dioxide levels and seem to be more drought-tolerant. But this benefit is a two-edged sword: weeds, many invasive plant species, and insect pests will also thrive in a warmer world. Water availability will be impacted in drier agricultural areas that need irrigation. At some point, the benefits to crops of increased carbon dioxide will likely be overwhelmed by the negative impacts of heat stress and drought."

- David Herring, U.S. NOAA Director of Communication & Education

Since Israel already has a hot, dry climate, there will be fewer heat-related benefits compared to colder countries. Even if some changes in climate offer opportunities, for example in agriculture in some regions, it still requires local populations to adapt their existing infrastructure to new conditions, which requires resources and know-how.

This said, since many climate change preparedness measures can also benefit society in other ways, we can still look at the crisis as an opportunity to bring positive changes.

Background information 1 - Are there positive impacts from climate change?

Quote source: NOAA Climate.gov<sup>24</sup>



## **Exposure to climate hazards**

## Exposure to heat and extreme heat

"Summer morning heat index" data from the Technion<sup>13</sup>

Several phenomena can be observed from the data:

- 1. There was a marked increase in summer morning heat index between the decade of the 1980s and the 2010s.
- 2. Areas with more trees and vegetation show a lower heat index. For example, you can see how the Al-Kashef forest area (Shefa-'Amr forest) is cooler than the rest of the area every decade.
- 3. There are "hotspots" in areas without vegetation cover: within the built-up area and also in many agricultural areas that are presumably without crops during the summer months. This is logical as bare soil tends to heat up fast however, when temperatures decrease at the end of the day, the soil probably cools down faster than buildings that have captured heat throughout the day.
- 4. There are "hotspots" on synthetic turf sports fields. Note that in addition to the sports fields visible in the 2021 data, four additional "multi-pitch"/ football fields were recently built with synthetic turf.

#### Summer morning heat index trend over four decades



Figure 16 - Summer morning heat index for 4 decades, Shafran-Nathan and Broday 2022<sup>13</sup>



#### Summer morning heat index data: explanation

The "heat index" is one measure of "feels-like/perceived temperature".

Different measures exist to assess heat load. The heat index from the Technion used in this report is calculated using two measures:

- Average surface temperature calculated from at least 3 LANDSAT satellite images per year (i.e. at least 30 images per decade). These satellite images were captured every two weeks between May and September, around 10-11 AM. The images have a resolution of 30m x 30m.
- Average relative humidity calculated using the multi-hour measurements from the Israeli Meteorological Service meteorological stations. The closest stations to Shefa-'Amr are: Afek, Neve Yaar and Eschar.

Why does humidity matter? The body's main cooling mechanism is to produce sweat that cools the body as it evaporates. When the humidity in the air is higher, the same temperature will feel hotter to the body compared to a lower humidity, because it is harder for the sweat to evaporate.

→ Explanation and video from Weizmann Institute (in Hebrew)

**Note!** Remember that both "temperature" and "heat index" use degrees, but that a "heat index" of 32°C is not exactly the same as a temperature of 32°C. "Heat index" of 32°C can be felt from a temperature of 29°C with high relative humidity (60%), as well as from a temperature of 35°C in low relative humidity (10%) - see the heat index calculation table.

## Two characteristics should be noted regarding our index, due to the use of satellite images to measure temperature:

- The measured temperature is surface temperature, rather than air temperature. Usually air temperature (height of 1.4 meters) is less extreme than at the surface.
- The measured temperatures are mostly of surfaces exposed to the sun, although since the satellite images are from 10-11 AM, there is a little shade on the western side of buildings and trees.

Due to the limitations of satellite images (they measure surface temperature rather than air temperature, and at a specific time in the day) and meteorological stations (they are located some kilometers away from Shefa-'Amr), it would be more accurate to measure heat index using mobile meteorological stations within Shefa-'Amr. Despite this, our heat load index already makes it possible to identify "hot and cool spots", and also makes it possible to observe the trend of change over the last four decades.

Background information 2 - Heat index data

Sources: Shafran-Nathan and Broday 2022, Cher 2022 13,25



#### Summer morning heat index 2021 – NOAA health risk categories

The U.S. National Oceanic and Atmospheric Administration (NOAA) has defined heat index categories related to health risk in high-risk groups (see 'Sensitivity' section). Based on these categories, Shefa-'Amr's summer 2021 morning heat index suggests that **on average, during summer late morning, the city is generally at the level of 'Hot/Extreme caution'**, except for the forest areas. However, note that the NOAA values are determined for shady locations, while the measured heat index includes non-shaded surface temperature. As such, the NOAA risk category may be overestimated.



35°8°E 35°8'30°E 35°9'9'E 35°9'30°E 35°10'8° 35°10'8°E 35°11'E 35°11'8° 35°12'E 35°12'30°E Figure 17 - Summer 2021 morning heat index mapped according to U.S. NOAA categories

Heat index/ Apparent	General effect on people in high-risk groups							ter	nper	ature	(°C	)				
temperature				27	28 29	30	31 3	2 33	34	35 3	6 37	38	39	40	41 4	12 43
Caution/Very warm	Fatigue possible with prolonged exposure and/or physical		40	27 :	28 29	30	31 3	2 34	35	37 3	9 41	43	46	48	51 8	54 57
	activity		45	27 :	28 29	30	32 3	3 35	37	39 4	1 43	8 46	49	51	54 8	57
Extreme caution/ Hot	Sunstroke, heat cramps or heat exhaustion possible with		50	27 :	28 30	31	33 3	4 36	38	41 4	3 46	6 49	52	55	58	
,	prolonged exposure and/or physical activity		55	28 3	29 30	32	34 3	6 38	40	43 4	6 48	3 52	55	59		
			60	28 3	29 31	33	35 3	7 40	42	45 4	B 51	55	59			
Danger / Very hot	Sunstroke, heat cramps or heat exhaustion likely and heatstroke possible with prolonged exposure and/or physical	Relative	65	28 ;	30 32	34	36 3	9 41	44	48 5	1 55	5 59				
	activity	Humidit	70	29 ;	81 33	35	38 4	0 43	47	50 5	4 58	3				
- · · · · ·	and the second	(%)	75	29 ;	31 34	36	39 4	2 46	49	53 5	в					
Extreme danger/	Heat/sunstroke <b>nighly likely</b> with continued exposure		80	30 ;	32 35	38	41 4	4 48	52	57						
			85	30	33 36	39	43 4	7 51	55							
Non share always a factor to the factor of the factor of the state of			90	31 3	34 37	41	45 4	9 54								
values by up to 8°C.	ouy locations only. Exposure to jun sunshine can increase neat maex		95	31	35 38	42	47 5	1 57								
, ,	Source: NOAA, <u>Heat Index</u>		100	32 :	86 40	44	49 5	4								

*Figure 18 - NOAA health risk categories for high-risk groups, based on heat index. Table from Opitz-Stapleton et. al 2016*<sup>26,27</sup>



#### Summer morning heat index 2021 - identification of hot and cool spots



35°8'30°E 35°9'E 35°9'30°E 35°10'E 35°10'E 35°11'E 35°11'30°E 35°12'E 35°12'B Figure 19 - 2021 Summer morning heat index, with zoom-in zones marked from figures 20-23







Figure 21 -2021 Summer morning heat index, zoom 2, center, municipality and surroundings



°9'5"E 35°9'10"E 35°9'15"E 35°9'20"E 35°9'25"E 35°9'30"E 35°9'35"E 35°9'40"E 35°9'45 Figure 22 - 2021 Summer morning heat index, zoom 3, west





Figure 23 - 2021 Summer morning heat index, zoom 4, south-west

#### Summer morning heat index 2021 – average per neighborhood

The average summer morning heat index was calculated per neighborhood, excluding neighborhoods with no/virtually no houses.

As observed earlier, the neighborhoods that have fewer buildings and more bare land/ agricultural land show a higher average than the neighborhoods with more built-up area. This may seem like it contradicts the logic of 'urban heat island', however this is not necessarily the case. As mentioned earlier, bare soil tends to heat up fast – however, when temperatures decrease at the end of the day, the soil probably cools down faster than buildings that have captured heat throughout the day.





Figure 24 - Mean summer morning heat index 2021 per neighborhood, mapped out as equal intervals

#### Heat, topography and buildings

Shefa-'Amr is a hilly locality – the built-up areas are located at elevations between 50 and 250 meters above sea level (see 'Urban profile'). Related to this, some of the focus group participants shared insights from their experience:

- It seems that there are places in the city that suffer less from heat thanks to their higher altitude. Despite this, there were participants who live in higher altitude areas who stated that, today, due to the general increase in temperature, these places are also becoming hotter.
- It was mentioned that it is hotter on the higher floors of buildings.

Both insights make logical sense, but were not tested quantitatively.

#### Tree cover

Vegetation cover helps to cool air temperature, compared to dark surfaces such as asphalt or dry dark soil - especially trees that also provide shade. Therefore, heat exposure assessments often examine vegetation cover and/or trees.

#### Tree canopy

Using data from a recent national tree canopy mapping (Figure 25), the percentage of tree surface per neighborhood surface was calculated – see Figure 26. The two neighborhoods with the highest density of trees are Jabata in the west (visible in Figure 25 as well), due to



significant amounts of olive groves, and neighborhood referred to as 'the secondary school' in the east as it includes part of the Shefa-'Amr forest. The Old City neighborhoods, which feature dense building and narrow streets, have very few trees, as well as the neighboring area surrounding the municipality. This is also visible at the bottom-right of Figure 25.



Source: National tree mapping, Survey of Israel 2023 28

It is notable that there are quite many private plots of land within Shefa-'Amr that are currently planted with olive trees (see also 'Sensitivity – economic sensitivity of agriculture'). These contribute significantly to the tree cover of the city. Such olive trees do not significantly contribute shade to streets, but they may contribute to cooling overall. Sometimes, some of them are partially used as informal gardens: a few chairs are set in the shade of the tree. Of course, olive trees also have cultural value as a source of olives and olive oil, a symbol of connection to the land, and of Palestinian identity and resistance. At the same time, the environmental appendix of Shefa-'Amr's master plan states that the cultivation of trees within neighborhoods "causes annoying odors and waste" – this was not mentioned in focus groups.

It seems likely that many of these plots will become residential plots with housing – in detailed/local outline plans such as  $21613/\lambda$  (El Midan and El Basliye, approved 2016),  $21614/\lambda$  (El Hay El Akhdar, approved 2016),  $19678/\lambda$  (Western area, approved 2017), 261-0762591



(industrial area, approved 2022), 261-0585935 (El Wastani neighborhood, approved 2022) private plots currently covered with trees are marked as "housing". They cannot be marked as "public green space" since the plots are private, so it may still be that the owners will choose to keep the plots as agricultural. This may depend on economic pressure and demand for housing.



Figure 26 – Tree density per neighborhood (excluding neighborhoods with few/no buildings), measured using 2023 national tree canopy mapping, mapped out as equal intervals

#### **Roadside tree shade**

Using the national tree mapping, the government has also recently performed a mapping specifically of roadside tree shade.<sup>29,30</sup> This analysis shows that most Shefa-'Amr roads have few trees to provide pedestrians and the general area with shade. One of the two street segments that is shown to have a high amount of tree shade is actually a cemetery. Note that this analysis checked the surface of the shade case by trees, rather than the number of trees themselves (and does not include shade cast by buildings).





Figure 27 - Shade from roadside trees index 2023

Source: Survey of Israel, Ministry of Environmental Protection, Ministry of Agriculture and Rural Development<sup>29,30</sup>

#### **Tree felling**

The urban tree cover will probably decrease further due to tree felling, mainly to build houses and develop new neighborhoods, streets/intersections and other facilities (for example educational facilities), and without a municipal strategic plan to plant replacement trees.

Year	Number of tree felling/relocation licenses	Including
2022	269	<ul> <li>217 trees for the development of New Released Soldiers Neighborhood (51 olive, 130 pine, 36 cypress)</li> <li>72 olive trees for residential construction, for example in the neighborhood of Jabata (15) and El-Kharoubia (18)</li> <li>2 pines, dead/highly prone to collapse</li> </ul>
2021	96	<ul> <li>40 olive trees for residential construction, for example in the Abu Thabet neighborhood (9)</li> <li>37 olive trees for the construction of a parking lot for Sakhnin College</li> <li>15 trees for the construction of the Shefa-'Amr-road 781 intersection (10 chinaberry, 3 ficus, 1 cypress, 1 pomegranate)</li> <li>13 ficus trees related to damage or blocking of a sidewalk</li> </ul>
2020	62	<ul> <li>28 trees for residential construction, for example in the Abu Shehab neighborhood (10 olive trees)</li> </ul>

Table 4 - Tees with licenses for felling or relocation


		-	<ul> <li>28 trees to pave a road in the New Released Soldiers</li> <li>Neighborhood (21 cypress, 7 pine)</li> <li>5 trees for construction/installation of a road junction (olive and acacia saligna)</li> <li>1 cypress due to a health hazard</li> </ul>
2019	290	-	<ul> <li>245 Jerusalem pine trees for a school in the Abu Shehab</li> <li>neighborhood</li> <li>45 degenerated and dangerous dry trees (pine, cypress)</li> </ul>

Source: Meirim association<sup>31</sup> and the Ministry of Agriculture<sup>32–34</sup>

Notes: (1) There may be missing licenses in the table. (2) These numbers only show licenses, and not whether cutting or relocation has actually taken place. Licenses sometimes have conditions such as obtaining a building permit or for construction itself to start.

The development of the residences and the industrial area in the east, according to the Tamal/1036 plan, will also result in the felling of more than 7,500 trees.<sup>35,36</sup>



Source: GOVMAP<sup>6</sup>



#### Trees, equity and adaptation

The figures show that in the past 4 years, 717 licenses have been issued for tree felling or tree relocation, and that **the development of the eastern new neighborhood and commercial area will result in the felling of several thousand more trees**. This increases the residents' exposure to heat, and may also reduce the positive health benefits associated with trees and nature.

## The way that we define this issue can have an impact on which adaptive measures are proposed and prioritized.

**One way to define this issue** can be that "the need for housing, urban development and local employment results in tree felling and increased exposure to heat". If this is the issue, adaptive measures could be to build multi-story buildings in order to preserve some land for trees, as well as to plant replacement trees throughout the city where possible. Other measures can be focused on reducing exposure to heat in other ways: for example via artificial shading, heat-proof building design including green roofs, etc.

**However, we can also define this issue in a different, broader way**: "municipal land and associated resources have been inequitably allocated in Israel, as Arab localities have been dispossessed, fenced in by various means including by man-planted forests, and disregarded in terms of the development of revenue-generating industrial zones". Relating to the issue of trees and tree felling, the forest in the east is a JNF/KKL forest which was planted in over several years (1959 – 1987), with the areas closest to the built environment being the ones planted the earliest. It is known that, in general, one of the factors that JNF/KKL used when deciding where to plant forests was to choose locations that would limit the growth of Arab localities. There are no known sources specify that this specific forest was planted explicitly to limit Shefa-'Amr's growth, but in the Galilee, this was a general approach while the government actively established new Jewish localities in the region and encouraged people to move there as part of the 'Judaize the Galilee' plans.

Adaptive measures relating to the issue defined in this way could include policies that address discriminatory/inequitable planning and resource allocation. Indeed, perhaps in order to preserve space for trees while also continuing to grow and develop, the city 'simply' needs more space. Of course, this last sentence applies to many localities in Israel, which has a high population density as well as population growth overall. Furthermore, since space will remain scarce in any case, the adaptation measures mentioned earlier remain relevant. Reducing exposure to heat requires a set of complementary measures, not a single silver bullet.

**Our claim is that, taking equity into consideration**, one of the (several) measures to increasing tree cover in Arab localities and lower heat exposure could involve re-assessing resource distribution (land resources, industrial revenue resources – see also 'Financial capacity'), via existing the existing mechanism of Geographical Committees and/or new mechanisms. To be clear, this is not because the Shefa-'Amr forest was planted by JNF/KKL. It is because resources were intentionally inequitably distributed, a discriminatory overarching policy of which JNF/KKL is part.

This can be seen as an example contrasting 'incremental adaptation', which aims to reduce the impacts of climate change in a way that mostly protects existing systems, with 'transformative adaptation' that aims to address underlying inequities.

Intersectoral issues 1 – Trees, equity and adaptation

Source: JNF/KKL<sup>7</sup>, Braverman 2009<sup>37</sup>, Akevot Institute 2021<sup>38</sup>, Heikkinen et. al 2019<sup>39</sup>



Public grounds	Shading	Recommended action
Playgrounds*	Most are shaded	Check if shading meets latest
		standards
	Al-Fawar playground is not shaded	Add shading. Recommended to
	(next to police station)	combine artificial and tree
		shading.
Sports fields	No shading in any of the sports fields	Add shading. Opportunity for
		solar panel setup. Possible
		priority to fields with synthetic
		grass.
Workout equipment	No shading in any of the workout areas	Add shading. Recommended to
(outdoors)		combine artificial and tree
		shading.
Other	<ul> <li>Many bus stops are not shaded</li> </ul>	<ul> <li>Bus stops shade mapping</li> </ul>
	- Schools: unknown	<ul> <li>Schoolyards shade mapping</li> </ul>
	- Public benches: unknown	- Strategic shading plan
	- There is a request for shade for the	
	inner courtyard of the Center for the	
	Elderly	
	- There is a request for shade for the	
	pétanque court used by the elderly	
	(close to the main community center),	
	budget was made available via	
	MUNI100	

## Outdoor public facilities for leisure, sports and transportation

\*Public playgrounds have regulations from 2019 that require shading for all new playgrounds - in our survey we did not check if existing shading meets the new standards exactly, but only if there is shade in general.<sup>iv</sup>

Other measures that can prevent exposure to heat in outdoor public facilities:

• Lighting in the evening: during the hot season allows the use of the outdoor facilities during cooler hours in the evening

## Populations with higher exposure to heat

The focus group participants mentioned three main groups of people with higher exposure to heat:

- **People who work outdoors** see section below. There are outdoor workers who talked about fainting at work, and skin and eye problems. There are also outside workers who said they are fine with the heat. They still also said it could be difficult. Some participants were family members of people who work outdoors and said that they worry about them.
- **People without a driver's license** there were several stories about people without a driver's license who are exposed to the heat and find it difficult to walk without infrastructure such as benches and trees.

<sup>&</sup>lt;sup>iv</sup> Terms of the regulation<sup>135</sup>: Main requirements: (1) Shading in the playground will be set up out so that at the reference time the amount of shade will be at least 70 percent of the total area, including the free space around all the facilities in the playground; (2) The shading in the playground will be set up in such a way that it will be shaded according to the provisions of this regulation, at the very least, during the summer period between 10:00 and 16:00 (April 1<sup>st</sup> – October 1<sup>st</sup>).



- **Children** many participants said that children are more exposed (and sensitive) to heat. Examples of relevant situations that were mentioned:
  - **Children who walk to school when there is no shade on the road** (for example between Shefa-'Amr and Ibilin).
  - **Children who play outside even if it's hot**: some people said that children don't care less if it's hot, they want to play anyway, and then are exposed to the heat see "Mapping of public playgrounds for leisure and sports"
  - **Exposure to heat of young children in strollers**: this was a hypothetical example of a mother having to run errands, who doesn't have a driver's license nor someone else to take care of the child, and who has to run errands (for example, the post office) with a young child in a stroller in the heat.
  - Children trapped or forgotten in cars: this case was not mentioned in the focus groups, but it is relevant to add. From 2010-2020, 34 such deaths were recorded in Israel.<sup>40</sup>

Note: Going to school and playing outside can contribute to children's physical and mental health. In this context, it is better to find solutions that reduce exposure to heat without reducing these activities. For example, shade in the streets and playgrounds (and also to have playgrounds and parks close to the house – see 'Infrastructural capacity').

## Outdoor workers: demographic data<sup>v</sup>

Populations exposed to the weather including heat and extreme heat include outdoor workers: in construction and infrastructure, agriculture, landscaping, garbage collection, hawkers, etc. This section presents the number of workers in two of these work fields by statistical area.

Note that the location of the exposure is not at their place of residence, but at their place of work, which is often outside of Shefa-'Amr. Therefore, targeted protective measures should be defined for the workers themselves and their work environment.

Also note that many but not all jobs/tasks within these fields involve exposure to heat. For example farmers that primarily grow grain spend more time in tractors which are usually air-conditioned, some construction is indoors, and some infrastructure works are done at night.

According to the 2008 census:<sup>41</sup>

- Agricultural workers make up a small proportion of those aged 15 and over who worked in 2008: 0.7% in total.
- It seems that there were relatively more agricultural workers in statistical area 3 (Suftadi, Al-Hai Al-Khadar, part of Al-Midan)
- Construction workers make up a significant proportion of those aged 15 and over who worked in 2008: 12.1% in total.
- It seems that there were relatively more construction workers in statistical areas number 1 (Ajrush, Al-Karach, Abu Thabat, Ain Aafia, Abu Shahab and Alek Sara Ibn Sid), 2 (Almidan,

<sup>&</sup>lt;sup>v</sup> The most recent source of information available by statistical area is the 2008 census - numbers may have changed significantly in the past 14 years. It is therefore recommended to update the details once the 2022 census data will be available.



Wadi Al-Khamam and Al-Basaliya), 5 (Marashon, Jabata and a new neighborhood for veterans) and 10 (the industrial area).

The overwhelming majority of agricultural and construction workers are men, but there ٠ are also some women who work in agriculture, both as employed hands and for personal consumption.

Statistical area	Percentage of 15- year-olds and older who worked in 2008 with the occupation "professional workers in agriculture"* *Just men	Percentage of 15- year-olds and older who worked in 2008 in the "agriculture" branch **Mostly men	Percentage of 15- year-olds and older who worked in 2008 in the "construction (construction and civil engineering works)" branch *Mostly men
Total Shefa-'Amr	0.7	0.7	12.1
1	0.4	0.5	22.2
2		1.1	15.7
3	3.1	1.9	10.8
4	1.8	1.7	7.2
5			13.4
6			6.6
7	0.5	0.4	6.3
8	1.4	1.0	9.0
9	0.5		5.8
10	1.1	1.1	15.2

Table 5 - Demographic data relevant to exposure to heat

Source: 2008 Census, CBS<sup>4</sup>

## Focus group participant quotes

"God help those who work outside, in construction and in the streets"

"The street workers and the construction workers, it's hard for them to work during the day when it's hot"

Quotes 4 - Quotes about outdoor work, focus group participants



## **Exposure to risk of forest fires**

During periods of drought and very hot weather, the risk of forest fires is higher.

There were 24 cases of forest fires in the previous decade - most of them small, except for one fire in May 2019 that burned 266 dunams.



Figure 29 - Forest fires January 2013 - January 2023 (source: JNF/KKL GIS site)<sup>42</sup>

According to a study commissioned by the Ministry of Agriculture and Rural Development, there are two areas in Shefa-'Amr at the forest-urban interface that require fire buffer zones.

- 1. The interface area between the Abu Shehab neighborhood and the Shefa-'Amr forest (risk level 3 out of 35)
- 2. The interface area between the main community center, Ibrahim Nimer Hossein comprehensive school C, Al-Karak neighborhood and Shefa-'Amr forest (risk levels 3 and 4 out of 35)

These areas are the responsibility of JNF/KKL. There is no information regarding implemented or planned measures (an email to JNF/KKL was not answered, and this topic was not included in interviews). Note that the boundaries of the second area will shift with the implementation of development plan Tamal/1036.





Figure 30 – Screenshot of maps showing the study to identify the need for buffer zones around localities to prevent the spread of forest fires (source: screenshot of Ministry of Agriculture GIS site)<sup>43</sup>



## **Exposure to flooding**

## Flooding factors in urban areas

Rivers/streams and confluences are exposed to flooding when the flow of water floods the stream bed ('fluvial flooding'). The more water arrives from upstream, the greater the flow volume of the stream. The water flows from high to low terrain (according to gravity), and thus a low area from which it is more difficult for water to flow out is more vulnerable to flooding, especially if it receives a large volume of water in a short time.

In this context, river/stream confluences in low-lying areas are vulnerable to flooding. In addition to this, closed facilities (such as a house, basement or closed yard) that are located on lower ground than flowing water are also exposed to flooding – i.e. this may be next to a stream but can also be anywhere where rainwater surface runoff is directed into closed facilities due to local topography and the slope of the road. The water will drain towards the low area and remain if there is no outlet.

When it rains, the amount of surface runoff water depends on the intensity and volume of rainfall, but also on how much water is being infiltrated into the ground or delayed along the way (as well as how much water evaporates along the way). Vegetated soil as well as drainage pipes can 'absorb' water, reducing runoff, while impervious materials like asphalt cannot. Structures like regulation/bioretention basins, dams or cisterns can retain water and release it later on, in order to reduce the peak flow of runoff surface water.

According to these principles, the exposure to flooding depends on: the intensity and duration of rainfall, the topography (slopes), and how much opportunity the water has to infiltrate and evapotranspirate during it flow downstream.

Background information 3 - Flooding factors in urban areas

There is no comprehensive study regarding the risk of flooding within Shefa-'Amr (see 'Institutional/political capcity'), but there are some important known inputs:

- **Precipitation:** As reported in the "climate hazard" section, in the Western Galilee there has been a trend of several decades of a decrease in the number of rainy days and an increase in the average daily intensity. Projections estimate an expected increase in annual precipitation until 2050, and then a decrease.
- Streams: 3 streambeds (wadis) are located between the elevations of Shefa-'Amr, flowing from east to west: Wadi Al-Saqia (Nahal Shefaram), Wadi Abu Afen (Nahal Khanaton) and Wadi Al-Fawar (Nahal Shafron). The environmental appendix of the Shefa-'Amr master plan describes them as "secondary drainage channels with 50 meter banks on each side".
- The built-up area has grown to cover most of the original water courses of Wadi Abu Afen and Wadi Al-Saqia. There are certain street sections that run along the course of



the stream (such as the southern part of Wadi Al-Saqia; Muhammad Abdu and Al-Mutanbi streets along part of Wadi Abu Affan; or the northern entrance to the city at the Naema Interchange), but most of the built-up area does not take into account the streams. As such, most of the natural/original drainage routes have been altered and are not clearly visible as actual 'streams'.

• **Streams confluence points:** There are two areas in the built-up area where streams meet: the Wadi Al-Saqia neighborhood (and the adjacent southwestern of the industrial area), and the Al-Ayn neighborhood (in the area around the firefighting station).

## Flood events and areas according to different sources

- There are no official records of flooding events, but it is known that there are floods every year (mentioned in focus groups, interviews and the Master Plan). Therefore, to map exposed areas according to past events, we used content from the focus groups and interviews, as well as systematically searched for records of incidents in Facebook and online media.
- Flooding events that have occurred in the past do not necessarily predict the exact location of future floods, but they give an indication of exposed areas until now and provide a basis for further discussion and analysis.
- Some people indicated that flooding issues have decreased in recent years thanks to infrastructure work (see 'Infrastructural capacity' and 'Institutional/political capacity'). Indeed, the December 2022/January 2023 winter seems to have features fewer published incidents. However, there is no solid evidence of this claim and a single year is not enough to establish a trend.

Neighborhood/ specific location	Flood mentioned in focus group or interview	Flood mentioned in news/social media	Negative impacts from floods indicated in questionnaire	Does the neighborhood include a stream?
Wadi Al-Saqia	Yes	Yes	Yes	Stream & confluence
Al-Ayn	Yes	Yes	Yes	Stream & confluence
Al-Midan	Yes	Yes	Yes	Stream
Al-Karak	No	Yes	Yes	Stream
Zaher al-Kanis	Yes	No	Yes	
Al-Birke	No	Yes	No	Stream
Abu Shehab*	Yes			
Ayn Afiye*			Yes	
Al Kharoubiye	No (mentioned but something decades ago)	Yes	(Yes, but large area)	

## Table 6 - Record of flood-related incidents from different sources



Wadi el Hamam	No	Yes	(Yes, but large area)	
Released soldiers neighborhood north	No	Yes	(Yes, but large area)	Stream
Elderly center (Municipality area)	Yes		-	
Western entrance (Neama)	No	Yes	-	Stream

\*In the feedback meetings, the municipality and the community said that it does not make sense to include these neighborhoods in the mapping of neighborhoods exposed to flooding, because there are no streams there and they are relatively elevated.

It is possible that participants who said there were floods in areas that seem to be low risk were thinking about sewage water floods (for which there is a higher risk in times of heavy rainfall, but which also occur during the dry season due to sewage pipe blockages), or about floods due to the slope of new/renewed asphalt roads.

In order to visualize exposed areas and impacts, a map was created to show recorded flood-related events – see Figure 31.

Sources for Figure 31 mapping (chronological order)

- Damaged car from flood: nevo.co.il legal database, lawsuit 48378-03-16 (Harel Insurance Company vs. Shefa-'Amr municipality)
- Flooded garden 2017: shared by resident
- Burst sewage line January 2018 (Facebook)
- <u>Street collapse December 2018</u> (Facebook)
- <u>Flooded street December 2019</u> (Facebook)
- <u>Flooded yard 2020</u> (Facebook)
- Flooded street December 2020
- Flooded street 2015 (2020 (Arab48.com, Ashams.com)
- Flooded house December 2021 (Facebook)
- Flooded street January 2022





Figure 31 - Map of past flood-related events (not exhaustive)

Sources: see previous page



Based on the mapping and further input from focus groups and interviews, the following overview of flood-related events frequency, impact and risk factors was define. This is a useful analysis in order to define appropriate adaptation measures.

Table 7 - Frequency, impacts and risk factors related to flooding in Shefa-'Amr

Frequency	Event	Impact on public	Impact on municipality	Risk factors
6	Traffic disruption (usually not more than a couple hours)	May cause delays in cases of urgent need (e.g. medical services)	Lack of resident satisfaction	Location along wadi/stream with insufficient drainage
Common	Potholes	<ul> <li>Car damage</li> <li>Pedestrian</li> <li>accidents</li> </ul>	<ul> <li>Repair costs</li> <li>Lawsuit costs</li> <li>Lack of resident satisfaction</li> </ul>	Drainage/ runoff management, road quality
	Sewage overflow	Health and environmental hazard	- Lawsuit costs - Lack of resident satisfaction	<ul> <li>Insufficient</li> <li>sewage system</li> <li>Informal</li> <li>connections</li> <li>between home</li> <li>roof gutters and</li> <li>sewage system</li> </ul>
Sometimes	Water flows into yard/ building (private or public)	- Damage to furniture, stored commercial goods - Service disruption, e.g. school closed for the day	<ul> <li>Infrastructure costs</li> <li>Lawsuit costs</li> <li>Lack of resident satisfaction</li> </ul>	<ul> <li>Asphalt slope</li> <li>leads runoff water</li> <li>into yard/ house</li> <li>entrance after</li> <li>new/ renewed</li> <li>asphalt</li> <li>Insufficient</li> <li>sewage system</li> </ul>
Rare	Car stuck in flooded street (2 recorded events)	- Car damage - Danger to driver/ passengers	Lawsuit costs	Location along wadi/stream with insufficient drainage
	Street collapse (1 recorded event)	Danger	Repair costs	
Never	Drowning death	Danger		



# Vulnerability – sensitivity and adaptive capacity

The previous sections presented (1) the climate hazards in Israel and especially in the northern region, and (2) the exposure of populations in Shefa-'Amr to heat, forest fires and floods according to the natural and built environment (and, in terms of heat, also according to professions more exposed to outdoor temperatures).

In this section we will focus on assessing vulnerability. Vulnerability is the tendency to be adversely affected (or harmed) by a hazard. For example, two people may be similarly exposed to heat because they are in the same environment, but they may each have different levels of vulnerability to this heat.

"Vulnerability" can be divided into two more concepts: "**Sensitivity**" considers susceptibility to damage, often related to personal factors, and "**Adaptability**" considers the personal and social ability to prepare for, cope with, and recover from a hazard.

## Demographic data related to sensitivity and adaptive capacity

Indicators regarding vulnerability to climate change usually include demographic indicators – for example, physical sensitivity to heat is affected by age, economic sensitivity to heat is affected by type of work, physical capacity to cope is affected by physical abilities, economic capacity to cope is affected by economic status, and so on.

Statistical area	% of ages 65+	% of households with one or more people age 65+	% of households with age 65+ that are single-person households	% of ages <5	% of ages 5+ who have great difficulty or cannot walk indoors or go up and down stairs	% of ages 5+ who have great difficulty or cannot dress or bathe	% of ages 15+ who worked in 2008 as "profession al workers in agriculture" (only men)	% of ages 15+ who worked in 2008 in "constructio n (including civil engineering works)" branch
Total	5.0*	14.4	29.8	10.1*	3.0	1.1	0.7	12.1
1	3.7	9.0	12.2	9.8	4.0	1.2	0.4	22.2
2	3.2	10.3	17.0	8.2	5.1	1.3		15.7
3	5.0	13.1	22.3	10.0	0.6	0.5	3.1	10.8
4	5.2	11.9	17.6	9.8	1.1	1.0	1.8	7.2
5	3.5	9.6	7.6	12.0	0.9	0.3		13.4
6	6.3	13.8	51.4	13.0	1.2	0.4		6.6
7	9.0	28.0	42.3	12.2	7.3	2.6	0.5	6.3
8	4.2	10.9	17.2	9.8	2.4	0.8	1.4	9.0
9	5.2	22.7	39.5	8.3	1.3	0.9	0.5	5.8
10	5.8	7.9	26.4	10.0	0.8	1.1	1.1	15.2

Table 8 - Demographic data relevant to climate vulnerability

Source: Census 2008 41

\*2021 update: ages 65+ is 7.6%; ages <5 is 7.0% <sup>8</sup>



To evaluate the economic situation in the various statistical regions within Shefa-'Amr, there are two official sources:

- The 2012 national poverty ranking<sup>44</sup>
- The 2008 socio-economic index<sup>vi 45</sup>

Since neither are up to date, we have combined them to look for trends as a basis for discussion with the community and professionals (see 'Financial capacity').

Statistical area	Socio-economic cluster, 2008 (1 – 20)	Poverty ranking, 2012 (1 – 10)	Combined (2 – 30)	Notes about the 2 indicators
1	4	2	6	Both point to the lowest relative economic situation
2	4	3	7	
3	5	3	8	
4	5	3	8	
5	5	3	8	
6	7	2	9	Contradiction
7	7	5	12	Both point to the highest relative economic situation
8	5	3	8	
9	7	4	11	
10	7	2	9	Contradiction

Table 9 - Economic situation by statistical area (lowest highlighted in orange, highest highlighted in green)

Sources: Census 2008<sup>45</sup>; National poverty ranking 2012<sup>44</sup>

## The following sections will refer to these two sets of data and expand on their relevance.

<sup>&</sup>lt;sup>vi</sup> The most recent source of information available by statistical region is the 2008 census - numbers may have changed significantly in the past 14 years. It is therefore recommended to update the details once the 2022 census data will be made available.



#### Economic situation per statistical area: indicator details

**The 2008 socio-economic index:** calculated using 16 variables for the 1,616 geographic units, and then classified into 20 clusters according to the variation of the index values. The variables, according to the 2008 census data:

- Demographics (median age, dependency ratio, average number of people in a household)
- Education and training (average years of study and % of academic degree holders aged 25-54, % working in academic or managerial positions)
- Employment and pensions (regarding income from work: % of those with income aged 15+, % of women aged 25-54 without income, % of those with income more than twice the average wage, % of those with income below minimum wage; and % of those receiving income support and supplementary income in old age/ as survivors)
- **Standard of living** (average monthly income per capita, average number of vehicles for those aged 18 and over, average number of rooms and bathrooms in the house, % of households with access to a computer and the Internet)

**National poverty ranking 2012:** shows the proportion of administrative families below the poverty line, calculated based only on income from work (i.e. not including Social Security benefits, capital income, etc.). Poverty line as defined by social security (NI). 'Administrative families' defined as family members registered at the same address. Decile 1 represents the lowest poverty ranking and decile 10 represents the highest poverty ranking – *however, for easier interpretation this scale has been reversed in table number 9 (1 = highest proportion of families in poverty).* 

Background information 4 - Existing indicators for economic situation per statistical area

## Sensitivity to heat-related risks

"Sensitivity" considers which areas or groups are more susceptible to suffering damaging impacts when exposed. Impacts can be physical, financial, or other types of damage.

Sensitivity factors	Explanation (based on focus groups)	Available data
Outdoor workers (construction and infrastructure, gardening, sanitation)	If working hours and wages depend on the weather (for example, fewer working hours on a very hot or rainy day)	According to statistical area,
Farmers	Agricultural productivity depends on weather that is suitable for crops and that can be predicted (see section on agriculture)	Census 2008

## **Economic sensitivity to heat-related risks**

As mentioned earlier:

- Construction workers make up a significant part of the Shefa-'Amr workforce: 12.1% in total in 2008. It seems that there were relatively more construction workers in statistical areas number 1 (Ajrush, Al-Karach, Abu Thabat, Ain Aafia, Abu Shahab and Alek Sara Ibn Sid), 2 (Almidan, Wadi Al-Hammam and Al-Basaliya), 5 (Marashon, Jabata and neighborhood new veterans) and 10 (industrial area).
- Agricultural workers make up only a small part of the Shefa-'Amr workforce: 0.7% in total 2008. It seems that there are relatively more agricultural workers in statistical area 3 (Suftadi, Al-Hai Al-Khadar, part of Al-Midan).



## **Tourism and climate**

The tourism sector is sensitive to the climate in different parts of the world - for example in villages that depend on ski resorts for income. Shefa-'Amr wants to develop its the still-modest tourism sector, and is investing in the preservation and development of sites such as the Old Market and the Dhahr al-Omar citadel. In this context, even if climate is not the most important variable, it is worth thinking about how to provide attractive conditions for tourists in an efficient and sustainable way. This can include pleasant temperatures in tourist and commercial sites and while walking between sites, accessibility of water taps, etc.

Intersectoral issues 2 - Tourism and climate



Figure 32- The plan to restore the citadel, which began in 2018 with a budget of 12 million NIS

## Physical and health-related sensitivity to heat-related risks

Globally, the three leading causes of death in heat waves are heart disease, respiratory disease and stroke. Apart from death or hospitalization, heat can also cause physical damage in the longer term in direct ways (for example from heat stroke, dehydration, etc.) or indirectly (for example - to the extent that high heat reduces physical activity outside, this can in turn affect physical and mental health).

Sensitivity	Explanation	Available data
factors	(based on clinical evidence)	
Cardiovascular diseases	High temperatures make the heart work harder (as part of the body's cooling mechanisms), and the resulting cardiovascular burden can increase risk for people with heart disease or hypertension. Note: globally, heart diseases is the number one cause of death in heat waves	
Respiratory diseases (especially COPD)	High temperatures strain the lungs due to heat-related hyperventilation, and also because of the effect of heat on air pollution. This can increase risk for people with lung disease Note: globally, lung diseases are the second leading cause of death in heat waves.	Smoking rates (Arabs in the North)

Table 10 - Physical sensitivity to high temperatures – summary overview



r		1
Kidney disease	Sweat production (as part of the body's cooling mechanisms) can lead to dehydration if lost fluids are not restored. Dehydration can cause death, but can also cause kidney injury or worsen kidney disease. People with chronic kidney disease are more at risk of heart attacks.	
Diabetes	Diabetes can cause a reduction in sweating and blood flow in the skin (both important body cooling mechanisms) - depending on the complications of the disease (peripheral neuropathy), the management of the disease and how long someone has lived with diabetes. Note: physical activity is one of the important components of diabetes management. To the extent that heat reduces outdoor physical activity, it can also impair diabetes disease management.	Prevalence for the whole city
Mental health (depression, psychotic disorders)	There may be an interaction between antidepressants and the body's thermoregulatory center; and between antipsychotic drugs and sweat and blood vessel mechanisms related to cooling the body. <i>Note: lower confidence due to lack of specific research</i>	
Use of certain medicines	Diuretics can cause dehydration if the lost fluids are not replaced. Certain drugs may change the body's heat regulation center (antidepressants, anticholinergic drugs, antiepileptics, blood pressure lowering drugs, muscle relaxants and opioids) and/or change the body's ability to cool itself through sweat glands and peripheral blood vessels in the skin (anticholinergic drugs, antihistamines, antipsychotic drugs, anti-vertigo drugs, antispasmodics in the bladder, anti-gastric secretions, muscle relaxants). Note: lower confidence due to lack of specific research	
Older age	Older age decreases the ability to sweat; and has an increased prevalence of risk factors such as heart disease, lung disease, medications, etc. In addition, heat can affect mental health, depending on the context: if heat causes elderly people who live alone to go out less, it can reduce social interactions, and increase loneliness (see also "loneliness and social isolation")	Residents aged 65+ per statistical area, Census 2008
Young age such as <1 or <4	Less ability to cool the body compared to adults; and faster heat absorption due to the ratio between the skin surface and body size (see also adaptive capacity)	Residents aged <5 per statistical area, Census 2008
Pregnant women	High temperatures can contribute to physical difficulty during pregnancy, and there are studies showing a connection between exposure to high temperatures during pregnancy and impact on birth outcomes such as premature births and low birth weight	
Recreational drug use	There are drugs that damage sweat mechanisms (cocaine) and/or blood vessels (cocaine and ecstasy) related to cooling the body and/or that reduce the sensation of heat (cocaine). Apart from physiological effects, drugs including alcohol impair the ability to make reasonable decisions.	

Sources: Ebi et al (2021)<sup>46</sup> , Sorensen et al (2022)<sup>47</sup>



Notes:

- (1) **Women:** There are climate change preparedness programs that include women in the risk groups related to high temperatures and heat waves. There is currently no clear conclusion regarding a possible difference in physical risk between women and men. This may be because it is challenging to distinguish between physical effects and social effects. Apart from health risk, there is research that indicates that there can be a difference regarding the level of thermal comfort. Overall, it is recommended to pay particular attention to the needs of women especially if their vulnerability is less related to physical differences, and more to the social context. See also the box on 'Violence'.
- (2) Medications: The possibility of medications increasing the patient's sensitivity to heat is not a reason not to take prescribed drugs. Instead, patients are advised to take protective measures to avoid excessive heat exposure (carry water and drink regularly, wear a hat, wear loose and light clothing, avoid excessive exertion in the heat, avoid spending too much time in the heat and in the sun) and seek help if they feel signs of heat illness. In general, you should consult a pharmacist in case of questions about medicines (note that there are also medications that affect the sensitivity of the skin to sunburn).

## Physical sensitivity of the Shefa-'Amr population compared to Israeli population

Regarding diabetes, heart disease and respiratory disease, there are no publicly available data by statistical region. However, it is worth noting that at the level of Shefa-'Amr (and the Arab society as a whole), physical sensitivity is relatively high compared to the national average according to prevalence rates and risk factors for the following diseases:

	Shefa-'Amr (or Arab society)	National
Standardized rate of diabetes cases, per 1,000 inhabitants	<ul> <li>77.3 (2014 - 2016)</li> <li>79.6 (2017 - 2019)</li> </ul>	• 56.2 (2014 – 2016)
Smoking rate age 21+ 2018-2020 (risk factor for respiratory and heart diseases)	38.2% (men), 10.2% (women) (Arab society overall)	25.6% (men), 14.8% (women)
Prevalence of overweight or obesity, % of all students (risk factor for diabetes and heart disease)	<ul> <li>Grade 1, 2016-2017: 21.0</li> <li>Grade 1, 2017-2018: 21.6</li> <li>Grade 7, 2016-2017: 39.0</li> <li>Grade 7, 2017-2018: 44.6</li> </ul>	<ul> <li>Grade 1, 2016-2017: 18.0</li> <li>Grade 1, 2017-2018: 18.3</li> <li>Grade 7, 2016-2017: 30.0</li> <li>Grade 7, 2017-2018: 29.7</li> </ul>

Tahle	11.	- Comparina	nhysical sensi	tivity	factor	s in Shi	ofa_'/	Amr vs	national l	evel
<i>i</i> ubic		companing	physical sensi	civicy	Juctors	, 111 3110	Ju /	unn v.s.	nationari	LVCI

Sources: smoking in Arab society – The Galilee Society (2018)<sup>48</sup>, diabetes in Shefa-'Amr – CBS<sup>8</sup>, diabetes national – Mabat survey, overweight and obesity Shefa-'Amr<sup>8</sup>, overweight and obesity national – Mabat survey

## *Identification of areas with more sensitive populations (according to available data)*

According to the demographic data (see table 8):

• **7.6% of residents are 65 years old or older.** This is an increase compared to 5.0% in 2008, however it is still less than the national population rate of 12.1% (end of 2020).



- In 2008, there were relatively more people aged 65+ and also living alone in statistical areas number 7 (the Old City), number 6 (Ela'in and part of Marashon) and number 9 (Wadi Elsaqia, Zahr Elkanis, Osman).
- **7.8% of residents are under the age of 5.** This is a decrease compared to 10.1% in 2008, and it is also less than the national population rate of 9.8%.
- In 2008, there were relatively more children under the age of 5 in statistical areas number
   7 (the Old City), number 6 (Elain and XXX) and number 5 (Marashon, Jabata and a new neighborhood of veterans), all with 12-13% young people under the age of 5.



Figure 33 - Percentage of population below age 5/ ages 65+ in Shefa-'Amr. Source: CBS<sup>8</sup>



## Loneliness and social isolation in older adults

Social isolation can be a vulnerability factor related to high temperatures in older adults. In addition, if people go out less on hot days it can reduce opportunities for social interactions and physical activity.

In several focus groups the theme of loneliness came up, especially with regards to older people living alone. The subject was mentioned by older adults themselves (especially women), and also by people concerned about them.

This is aligned with previous studies that found a relatively high proportion of older adults reporting feelings of loneliness in Arab society - for example 42.2% in the 2016-2014 CBS social survey, compared to 33.3% in Jewish society (and 24.1% in the general population of all ages).

The proposed explanation is that there are high expectations in Arab culture regarding intergenerational relationships, which cause significant loneliness if they are not fulfilled, for example due to social changes (Netz 2013, Laron et al 2020). At the same time, there are other studies that did not identify a higher rate in Arab society (Khalaila et al 2018 and 2021).

While the model of multi-generational living is still common, the trend is slowly decreasing. According to the 2008 census, 29.8% of households in Shefa-'Amr with someone aged 65+ are single-person households - this rises to 51.4% in statistical area number 6, and 42.3% and 39.5% in statistical areas 7 and 9.

Some focus group comments also suggested a relative decrease in family visits to older adults living alone. Participants explained that people have busier lives with work, the need to provide for the family, and the increase in the number of women who work.

Of course not everyone who lives alone is lonely or in a state of social isolation, but it can be a relevant factor. The quotes suggest a variety of experiences (see "Quotes 5" box).

Two dimensions relate this topic to sensitivity to high temperatures:

- Social isolation: based on objective number of social relations
- Loneliness: based on subjective personal feeling

1 - Social isolation can be a factor of healthrelated vulnerability to high temperatures – social isolation was associated with mortality in the heat waves of 1995 in Chicago and 2003 in Paris. Of course, Shefa-'Amr is a much smaller locality, with a higher prevalence of air conditioners and other differences. Nevertheless, there is relevance in the notion that an older person with less social support may have less access to health services and/or to instrumental support (such as fixing a broken air conditioner).

**2** - Heat can contribute to loneliness in an indirect way. To the extent that people avoid going out when temperatures are high (especially on foot), this can prevent social interactions and contribute to loneliness.

There is a study from Israel that shows an association between loneliness and physical inactivity – although the direction is not known (Netz 2013). In this context, it may be that older people who do not drive and who do not live within a comfortable walking distance to areas of public passage (shops, cafes, parks, benches in the shade) have less opportunity for both social interaction and physical activity. They are more dependent on visits and transportation from family, friends, or senior community centers.

Intersectoral issues 3 - Loneliness, social isolation and extreme heat

Sources: Netz 2013<sup>49</sup>, Laron et al 2020<sup>50</sup>, Khalaila et al 2017<sup>51</sup>, Khalaila et al 2021<sup>52</sup>





Focus group quotes - Older adults, loneliness and social connection/isolation

"It is a **basic right** to have some **public parks** for us elderly people so we could gather and chat maybe, **to communicate instead of feeling lonely at home**." (Elderly widow, age 65-70)

"- Don't forget that people are not social as they used to be. **People don't visit each other a lot.** 

- Some days I spend alone, nobody comes or visits me.

- In the past, women didn't work, now they do. Kids at school, the babies at the kindergarten, **everybody is so busy**." (Elderly widows, ages 65-70)

"- What can we do alone at home?

- You'll have depression. We have nowhere to go, my daughter comes back from work to her house she has kids, needs to make lunch for her family, and you cannot keep knocking the neighbors' door." (Elderly widows, ages 65-70)

"When I'm alone, I'm thinking 'why are they not coming, why are they not coming [to visit me]', I want them to come visit. And then when they arrive, I don't say a word but I think to myself, 'when will they go?' I love them and I love seeing them, but after they've eaten and drank, we're done, I want some quiet. It's not that I don't want them. I got used to quiet alone as well, quiet at home. ... When I work on embroidery, I am completely concentrated, I can't work if they visit." (Older woman, age 65)

"My son lives upstairs, so I see them come and go, but I live alone. It's nice to have them, I feel their steps, hear their voices, it's nice. ... Their voice is enough." (Elderly widow, ages 65-70)"

Quotes 5 - Older adults, loneliness, and social connection and isolation







## Extreme weather events, heat, and violence

While the topic is complex to research, there is research that associates extreme weather events as well as hotter-than-average temperatures with street violence and/or domestic violence. This is a brief introduction to some of the existing research:

- One recent study that looked at firearm violence in 100 cities in the U.S. from 2015 to 2020 found that 6.85% (almost 8,000 shootings) were "attributable to aboveaverage daily temperatures" (Lyons et al 2022). Risk increased with absolute temperature, and the study found that it also increased on days that were warmer than "would be expected for the season, even when the absolute temperatures are not extreme", i.e. also during winter. Possible explanations include the possibility that people are more likely to go outside on warmer days during the cold seasons, as well as increased aggression from heat stress.
- A 2022 review focused on gender-based violence which included 41 studies carried out in more than 40 countries concludes that the existing research suggests that extreme weather and climate events "can be associated with gender-based violence" (Van Daalen et al, 2022). Due to the complexity of the subject, the review calls for more research. It highlights that "extreme [weather and climate] events do not cause gender-based violence; rather, extreme events exacerbate drivers of violence or create enabling environments for this behavior. The primary causes are systematic social and patriarchal structures enabling and normalizing gender-based violence".
- One of the 41 studies mentioned above looked at intimate partner violence and days with a maximum temperature of over 34°C in Madrid from 2008 2016. It found that "the risk of intimate partner femicides increased three days after the heat wave, police reports of intimate partner violence increased one day after, and help line calls increased five days after" (Sanz-Barbero et al 2018).

Due to scope limitations, this research did not investigate this topic in Shefa-'Amr. One focus group participant did mention the topic, she said it was because she had heard about it at university. One interviewed professional said she thought there was an obvious connection and risk of increased domestic violence, also based on the evidence of increased domestic violence during COVID-19 lockdowns.

Of course, temperature and extreme weather events are only two additional variables within other factors related to street and domestic/gender-based violence such as socioeconomics, demographics and politics. Still, considering the acute current relevance of both topics in Arab society in Israel, this is a topic that warrants further consideration and research.

Sources : Van Daalen et al 2022<sup>53</sup>, Sanz Barbero et al 2018<sup>54</sup>, Lyons et al 2022<sup>55</sup>, Mahendran et al 2021<sup>56</sup>

Background information 5 - Extreme weather events, heat and violence



## Sensitivity to precipitation-related risks

In the "Exposure" section, we identified areas more exposed to flooding: streets and houses along streams (including Wadi al-Saqi'a, Wadi Abu Afen), as well as places that are not located along streams but where water flowed into yards and houses due to the slop of asphalt roads.

This section deals with variables related to sensitivity for those who are exposed to floods, as well as variables related to sensitivity to drought.

## Individual sensitivity to precipitation-related risks

Depending on the particular risk, there are personal and structural features that can increase sensitivity. Unfortunately, there is no available data to quantify or map out these factors.

Risk	Personal sensitivity factors		
Flooding inside a building/yard (house, business, public building)	Residential or commercial tenants/ owners where the building or yard are lower than the ground (including basements, which are present but not very common in Shefa-'Amr - there are two ongoing lawsuits suing the municipality for damages to goods stored in basements)		
	Residential or commercial tenants/ owners who store valuables on the floor/at a low height		
Flooding in the street	Pedestrians (including public transport users), especially with physical disabilities or difficulties, and especially pedestrians with no alternative due to lack of driving license or car.		
	Drivers (risk of accidents and damage to the car from potholes)		
Flooding or heavy rain in agricultural fields	Farmers who may endure losses from excess water (or water at the wrong time) – see 'Economic sensitivity in agriculture'		
Drought	Farmers who use rainwater to irrigate crops that are sensitive to drought – see 'Economic sensitivity in agriculture'		

Table 12 - Sensitivty factors to precipitation-related risks

Focus group participants – risk and damages from floods

"In my opinion [a rainy day is] a normal day but we must be careful with regards to accidents, keep more distance between the cars, especially when it's the first rain"

"I have a friend, more than once and more than twice the water entered his house [and the furniture was damaged], he threw it away and bought new furniture. And they have a disabled family member, the municipality comes, the water corporation too, they look, but this doesn't really help, it's like giving acamol to a sick person"

"We had a wedding at our neighbors', it was dark at night, a woman fell in a pothole in the street, she broke her leg, she reported it to the municipality"

Quotes 6 - Risk and damages from floods



## Economic sensitivity to precipitation at the municipality level

In terms of sensitivity to precipitation, there is also financial sensitivity at the level of the municipality itself:

- Sensitivity to flooding: cost of repairing damage to roads such as potholes, larger damage (in 2018 part of a road collapsed), or legal costs due to citizens suing the municipality for flooding-related damage
  - There is no data to quantify the issue of repairing damages
  - Legal records show that the municipality had to pay 157,927 NIS for one lawsuit related to flooding, and according to interviews two more lawsuits are ongoing where claimants are suing for about 450,000 NIS in total.
- Sensitivity to drought/decrease of rainy days: cost of watering public plants, including one grass soccer field



• There are two data sources to check trends: municipal expenses, and water volume for public gardening – see Figures 34, 35, 36.

Figure 34 - Water for public gardening expenses. Percentages show change from previous year. Source: Municipality accountant





Figure 35 – Volume of water for public gardening (calculated estimate). Percentages show change from previous year. Source: Calculated estimate based on expenses from municipality divided by price per cubic meter published by Water Authority



Figure 36 - Volume of water for public gardening. Source: CBS<sup>8</sup>



#### **Urban rainwater harvesting**

Rainwater harvesting, i.e. collecting and storing water in the winter to use it in the dry season, can reduce the cost of gardens irrigation at the private and institutional levels (municipality, school, etc.), as well as provide water for domestic use such as cleaning balconies. However, in Israel there is a 'gray' area regarding this practice.

On the one hand, it is illegal: "according to the Water Law 1959-59 all sources of water, including runoff and sewage water are public property and subject to the control of the state" (Cohen 2018). On the other hand, it does take place to a modest extent. Arab society has a legacy of water cisterns which were traditionally common, but are now rare. This is also true in Shefa-'Amr according to the focus groups and interviews. There are also current examples in Jewish society: in homes and institutions such as schools. In general, it's easy to find local advertising for domestic equipment for rainwater harvesting.

All in all, it seems that despite the law, there is no enforcement, or there is a certain tolerance for the practice at the domestic or non-commercial level - but it is not clear to what extent. This complicates possible discussions about which approaches to rainwater storage can be appropriate, efficient, or how to maintain the cleanliness of the tanks/ cisterns - which used to be under the supervision of official inspectors (Mazzawi and Sa'ar 2018).

Focus group participants:

"-The water that comes from the rain, from the roof, we can use it, we can clean the balcony or so.

-Some people build a rainwater storage unit, to take advantage of it. My husband's relative [in a village in the north] doesn't buy any vegetables, he does amazing things thanks to the rainwater storage.

- We have one, we use it but not all year"

It is worth noting that there have been several similar <u>law proposals</u> on the subject over the years (e.g. 2013, 2018) that did not pass, partly due to concerns from the Ministry of Health regarding sanitation. In contrast, other countries and cities encourage the collection of rainwater as a resilience measure in times of drought (for example in <u>Amman, Bremen in Germany, many states in the USA</u>, and in <u>Australia</u>).

Another point that could be worth investigating is whether the possibility of installing rainwater harvesting could be a positive incentive to encourage the disconnection of gutters from the sewage system (see "adaptive capacity – infrastructure").

Intersectoral issues 4 - Urban rainwater harvesting: policy, tradition, water shortages and sewage hazards

Sources: Cohen 2018<sup>57</sup>, Khenin 2013<sup>58</sup>, Khenin et al 2018<sup>59</sup>, Mazzawi and Sa'ar 2018<sup>60</sup>, examples from Amman<sup>61</sup>, Bremen<sup>62</sup>, USA<sup>63</sup>, Australia<sup>57</sup>



## **Economic sensitivity in agriculture**

In Shefa-'Amr, agriculture is the primary source of income only for a few individuals - in focus groups with people who work in agriculture and an interview with the head of the agriculture union, the estimate was that between 10 and 20 people depend on agriculture as a main source of income. For them, and also for people who engage in agriculture as additional income, economic sensitivity is relevant because of possible losses and costs such as water costs.

Within the municipal borders of Shefa-'Amr, the Ministry of Agriculture records 57.5% of agricultural lands as olive groves, and 23.6% are field crops and vegetable.

However, note that these numbers do not accurately represent all agricultural activities of Shefa-'Amr residents, for two reasons. The first is that not all agricultural activity is formally registered. The second is that there are Shefa-'Amr residents who own agricultural lands that were part of the Shefa-'Amr territory prior to 1948, but that are now in other municipalities (Zvulun, Kirtyat Ata, Jezreel Valley, Mate Asher, etc.).<sup>2</sup>

Similarly for livestock, some of the pasture areas (used to raise calves which are then sold) are located outside of the municipal territory. On the other hand, open barns (used to raise livestock for meat) are located in several different areas within the built-up area of the municipality. According to the environmental appendix of the Shefa-'Amr master plan, there have been proposals to consolidate livestock raising in one place located outside of the built-up area (at least 600-700 meters away from houses). However this might not be the wishes of livestock owners, and in any case it could require collaboration with other local authorities as it seems difficult to find an appropriate place with 200 available dunam within Shefa-'Amr municipality.

Type of agriculture	Quantity	Financial sensitivity to climate change-related risks
<b>Olive groves</b> , open-air – primarily local "suri" variety, rainfed	897.7 dunam (including 862.1 dunam for oil and 35.6 dunam for cured olives)	<b>Medium-low.</b> The 'suri' variety is relatively drought-resistant, and olives are secondary sources of income.
Different tree plantations, open-air	278.9 dunam	
Grains and vegetables, open- air	368.9 dunam	Medium-high. Grains are vulnerable to drought since they are rainfed. Vegetables require increasing amounts of irrigation and are vulnerable to bad weather.
<b>Covered vegetables,</b> i.e. in greenhouses	2.9 dunam (northwest)	Low
Livestock, in stalls when grown for meat and in pasture when raising calves Quantity estimation from 2006, focus group agreed with the high-level order of magnitude	<ul> <li>~200 head of cattle</li> <li>~4,070 head of sheep</li> <li>~3 breeders with 200-300</li> <li>~11 breeders with 100-200</li> <li>~120 breeders with 10-50</li> </ul>	<b>Medium.</b> High temperatures affect the health of livestock, and pasture feeding depends on rainfall.

Table 13 - Agriculture and sensitivity in Shefa-'Amr

Sources: agricultural area from Govmap, livestock numbers from Master Plan environmental appendix; sensitivity high-level assessment from desk research and focus groups



## Agriculture in Shefa-'Amr: historical and climatic factors

The history of agriculture in Shefa-'Amr is an interesting illustration of the combination of climate and non-climate factors leading to adaptive changes.

In Shefa-'Amr, "up until the last years of the British Mandate ... 90% of the Druze families, 80% of the Muslims and 70% of the Christians were engaged in agriculture", 65% of which lived off of their own land (Al Haj 1987).

These numbers dropped sharply during the 1950s and 1960s, due to land confiscations, the influx of 'internal refugees', government pricing of agricultural produce, and the reduction in available farmhands as people joined the labor market in Jewish localities – mostly as casual, manual laborers. This last trend was limited during the earlier years of military rule, however increased following several trends from the end of the 1950s to the end of military rule in 1966. For example, travel restrictions started to be relaxed due to a need for labor, and union protection was extended to Arab workers by the Histadrut in 1959 (Miari 1986, Ben-Porath 1966).

From the focus groups and interviews, a description of more recent history explains how agriculture continued to decrease as a primary source of income from around the 1970s to today.

One of the trends continued to be the increase of people going to work in the Jewish labor market, which despite low wage jobs was more profitable and efficient than the entire family working in agriculture. This reduced agricultural capacity and/or required the employment of paid labor to replace these family members.

However, other factors increased agricultural expenses as well. The increase in temperatures and decrease in precipitation led to the need for irrigation of vegetable crops, which were previously only rainfed (olive groves and "falah" grain crops remain rainfed) – and the price of water for irrigation has continuously increased (see section below). Eventually, some vegetables also came to require groundlevel plastic cover ("nylon") to retain moisture.

An increase in pests and diseases, which may be partially related to weather, also required more frequent use of pesticides. Use of fertilizer also increased. Finally, the price of diesel has increased too, and is now considered by farming participants to be their most significant expense.

In parallel to this combined increase of expenses, income has generally stagnated. This is partly due to competition from imports.

Another factor is that agricultural plot sizes decreased further every generation, being divided among children. This prevents of economies of scale that are necessary for crops like wheat, or that could make certain technological investments worthwhile. Furthermore, land is needed for housing.

In this context, the overwhelming majority of the population has left agriculture. Furthermore, many fields that had previously been used for grains and vegetables were turned into olive groves, as a secondary source of income – with cultural value as well – that requires very little maintenance. Some fields are rented out to the few remaining farmers.

Intersectoral issues 5 - Agriculture in Shefa-'Amr

Sources: Al Haj 1987<sup>2</sup>, Miari 1986<sup>64</sup>, Ben-Porath 1966<sup>65</sup>



## Olives

We did not find local forecasts regarding olive crop yield according to climate forecasts. An international model examining the Mediterranean region concluded that the yield of olives in the eastern Mediterranean may increase thanks to a predicted increase in precipitation, in contrast to the yield in the western Mediterranean which may decrease due to a predicted decrease in precipitation<sup>66</sup>. The climate forecast for the Galilee region does estimate an increase in the total volume of rainfall until the year 2050, then a decrease (see the 'climate hazards' section). Apart from rainfall, changes in temperature can also affect parasites, but there is a lack of research on this topic.<sup>67</sup>

It is worth noting that most of the olive groves in Shefa-'Amr grow "Suri" olives, a local and traditional variety that produces less fruit compared to other common varieties currently grown in Israel (not all local), but which is relatively 'indifferent' to irrigation, and functions to a similar degree whether it is irrigated or not - and hence also less affected by water shortages".<sup>68</sup> As such, the use of this local variety is a strength, also since the crop yield is relatively less important as most growers do not depend on olives as their main source of income.

## Vegetables

In contrast to this strength, vegetable crops in the open can be more vulnerable to weather conditions. In focus groups some participants reported damage to vegetables (spinach and beans) due to rain, and it was mentioned that lack of rain or cold can also damage vegetables. At the national level, the Kanat (Agricultural Natural Damage Insurance Fund) reported that in 2022 "the most damage during the past year was sustained by the vegetable growers... mainly in crops such as cucumber, corn, potatoes, pepper and tomatoes" (Kanat 2023). Several vegetable crops now need to be covered in groud-level nylon plastic. Altogether, in one of the focus groups with farmers, they indicated that sensitivity of vegetables to weather conditions was 'higher than medium'.

## Grains

Grains are quite resistant to bad weather, however as they are rainfed, their yield depends on a minimum amount of precipitation. Their harvest requires the rental of combine services, since almost none of the farmers have their own combine (providing such agricultural services is also a source of income). Crops are sometimes lost if harvesting is urgent due to upcoming weather but cannot be done on time due to the very limited number of combines.

## Livestock

Cattle and sheep are physically vulnerable to high temperatures. Cattle that is raised for meat is raised in open barns, and although these provide shade, their density increases temperatures. As such, it is common to have fans and water sprinklers to cool the animals. Cattle that is raised for calves production is typically taken out to pasture around February (note that most of the pasture lands are not within the municipality borders). However, insufficient or late precipitation can delay this by a month, due to resulting insufficient grasses and weeds – which means another month of feeding expenses. This said, the most significant factor affecting the livestock business is not climate, but competition from imports.





Figure 37 - Ministry of Agriculture "<u>Map of Agriculture in Israel</u>"<sup>69</sup> (purple are olive groves, yellow are open field crops, turquoise is pasture, and the blue outline is buildings for animals)

## Water

While olive groves and grain fields are rainfed, vegetable fields require irrigation – in contrast to several decades ago. In Israel, the price for all types of water for irrigation has continuously risen from the 1990s to 2015, and XX of agriculture currently uses treated sewage water (קולחין). In Shefa-'Amr however, the only water available for irrigation is high quality water that is suitable for drinking (מים שפירים), the price of which has decreased since 2015, but which remains more expensive than treated sewage water (see adaptive capacity – infrastructure). One of the active farmers in Shefa-'Amr says that cheaper water would allow two planting seasons rather than one.



## Adaptive capacity

**"Adaptive capacity"** is the ability of systems, institutions and humans to adjust to potential damage, to take advantage of opportunities, or to respond to consequences (adapted from IPCC 2021).<sup>70</sup>

In this context, "adaptive capacity" is similar to the concept of **"resilience"**: the ability of social, economic and environmental systems to deal with a dangerous event or trend or disturbance - to respond or reorganize in ways that preserve their function, their identity and their essential structures, while maintaining the ability to adapt, learn and transform (IPCC 2021).

Dimensions	Explanation	Extreme heat examples	Forest fire examples	
Preparedness	Measures taken in	Build shade facilities,	Create buffer zones in	
	advance	build public water	and around forests,	
		fountains, plant trees,	animal grazing	
		install air conditioning		
Coping/short-	Measures taken	Drink water, use air	Firefighting by	
term response	immediately while the	conditioning, perform	firefighters, evacuation	
	hazard is present	less physical activity,	of areas at risk	
		water plants, in case of		
		heat stroke call an		
		ambulance		
Recovery	Measures taken after	Medical treatment if	Forest restoration,	
	damage has occurred	there was a longer-term	repairing damaged	
		health injury; buy a new	buildings	
		plant if the old plant		
		died		

It's possible to consider different dimensions of adaptive capacity:

Adaptive capacity depends on the resources and dynamics within a household, community, society or organization. In this section we will look at several relevant types of capacity:

- **Financial capital:** financial resources at household and municipality levels, including income, assets, insurance, ability to access credit, ability to diversify
- Institutional and political capital: authority and influence, governance related to flood prevention and urban planning
- Infrastructure and technological capital: health and social services infrastructure; electricity, cooling and heating; stormwater runoff and drainage infrastructure; public leisure space infrastructure; drinking and irrigation water; other
- **Human capital:** education, municipal workforce, awareness and understanding of climate change and adaptation
- **Social capital:** perceived social resilience, trust in the municipality, social engagement, social infrastructure, intergenerational and interfaith matters, equity
- Environmental/natural capital: historical buildings, natural resources



## "Maladaptation"

Adaptation measures of behaviors are not always fully positive - they can have negative consequences and require complex compromises, although they are not always recognized.

- Example 1: The use of the air conditioner helps us deal with heat, but high amounts of air conditioner use causes greenhouse gas emissions due to the electricity used to run the air conditioners; they emit heat in the street; and their use also increases load on the electricity grid.
- Example 2: The use of desalinated water helps the country ensure the supply of drinking water, but also requires a lot of electricity, and the plants cause environmental damage.
- Example 3: Drinking soft drinks can help us feel less hot for a moment and provides energy from sugar and caffeine, but caffeine is also a diuretic (which can contribute to dehydration) and excessive sugar consumption is of course not healthy.

This is why it is important to understand consequences in a holistic way, and to consider alternatives and combinations of solutions.

Background information 6 - Maladaptation<sup>71</sup>

## **Financial capital**

Financial capital is often one of the first issues that people mention to enable preparedness, coping and recovery. This section will look at (1) the individual level, and (2) the municipal level.

## Financial resources at the individual level

Preparedness	To buy home insurance (floods, fires), buy agricultural insurance To build or renovate a house in a way that will be more adapted to the heat (pergola, orientation, etc.) and that will contribute to		
	absorption of rainwater (permeable flooring, green roof, etc.)		
	To disconnect gutters from the sewer line		
Coping	• To pay electricity bills (air conditioner, refrigerator)		
	<ul> <li>To pay entrance fees to air-conditioned leisure or sports places</li> </ul>		
	(gym, swimming pool, children's indoor playground משחקיה)		
	• To buy fuel or pay public transport fees in order to reach services		
	that support climate resilience (e.g. clinic), air conditioned		
	recreational areas, and public areas such as parks and the sea		
	<ul> <li>To pay water bills (irrigation)</li> </ul>		
Recovery	<ul> <li>To repair damage related to rain (e.g. from floods, leaks, or</li> </ul>		
	damage to the car from a pothole in the street) or fire		
	<ul> <li>To pay expenses related to recovery from heat-related illness</li> </ul>		
	<ul> <li>Economic recovery from agricultural losses</li> </ul>		

Table 14 - Examples of adaptation measures that require financial capacity



According to the <u>national socio-economic index from the CBS for the year 2019</u>, Shefa-'Amr is in cluster 3 out of 10 (10 is the cluster in the highest socio-economic situation). Arab localities in the same cluster include: Nazareth, Taybe, Tamra, Araba and 29 smaller localities. The four Jewish localities in the same cluster are all located in the south: Arad, Netivot, Ofakim and Mitzvah Ramon.

As can be seen in the 'city profile' section, the average salary for employees who reside in Shefa-'Amr has increased over the past decades, however the percentage of employees that earn a salary that is lower than the minimum salary has remained at a similar level (49.6% in 2019).

Within the different statistical areas in Shefa-'Amr, according to various CBS data from 2008 and 2012 (see "Demographic data" table 8 in the previous section):

- The socio-economic status is relatively lower but not by much in the northeast of the city: in statistical areas number 1 (Ajrush, Al-Karak, Abu Thabet, Ain Aafia, Abu Shhab and Alek Sara Ibn Sid) and 2 (Almidan, Wadi Al-Hamam and Albasliye).
- The socio-economic status is relatively higher but not by much in the center and southeast of the city: in statistical areas number 7 (the Old City) and number 9 (Zaher al-Kanis, Wadi Al-Saqia and Osman).
- The two different source of data are inconsistent regarding statistical area number 6 (Elain and part of Marashon). According to the 2012 poverty ranking, this area has a relatively high "proportion of administrative families below the poverty line", similar to areas 1 and 2. In contrast, according to the socio-economic clusters index from 2008, the area is in a relatively higher cluster compared to other areas in Shefa-'Amr similar to areas 7 and 9. It is hard to explain the difference as the two indices measure different things.
- It is likely that in each statistical area that is mentioned as having a higher or lower socioeconomic status there are also differences between and within neighborhoods, however there is no data at this level.

As these data are more than 10 years old, in focus groups and interviews we also asked about socio-economic status in Shefa-'Amr, to check that there have been no significant spatial changes. Most of the participants we asked agreed that the economic situation is relatively more difficult in the northeastern neighborhoods. At the same time, most of the participants also stated that there are people in a more difficult economic situation scattered throughout the city. They cited as an example retired adults who depend on National Insurance for income.

## Focus group participant

"Widowed women, single women, it's hard for them to deal with so many expenses on their own, they don't use the A/C because it's too expensive, and you can't play with the IEC, they cut off the electricity"

Quotes 7

Some participants thought that asking about the economic situation by neighborhood is a sensitive issue, in part because there is diversity within neighborhoods, and possibly due to stigma around the topic of poverty.



**Access to credit:** An additional comment that can be made with regards to financial resources at the private level is the low level of access to bank loans in Arab society in Israel overall. According to a 2021 article, only 2% of mortgages in Israel are provided to Arabs, 12% of Arab adults don't have a bank account (1% of Jews) and 50% do not have a credit card (15% of Jews). The interest rate paid by residents of Arab localities is also 0.3% higher than those in Jewish localities.<sup>72</sup>

**Insurance coverage:** Home and agricultural insurance are also relevant to financial resources, especially for the 'recovery' part of adaptation (see also Felsenstein et al 2018).<sup>73</sup>

It is known that the rates of home insurances are low in the Arab community – for example, according to CBS 2018 data households in Arab localities spend 7 shekels per month on average on home insurance, compared to 76 in Jewish localities. When looking at the same expenditure for all localities by socio-economic cluster, the expenditure is 7 shekels in cluster 1, 13 shekels in cluster 2, 26 shekels in cluster 3, and increasing to 191 shekels in cluster 10. There is no data available for Shefa-'Amr specifically.

Regarding agricultural insurance, according to interviews and focus groups, most people in Shefa-'Amr active in agriculture do not purchase agricultural insurance. Reasons include that for most agricultural income is not declared (note agriculture is not the main source of income for most, as many grow olives and/or vegetables as additional income and as part of tradition), trusting 'what will come', and saving on the expense. Only one person, whose income does depend on agriculture, indicated that this year, in contrast to previous years, he insured some of his fields considering climate risks.



## The economic burden of access to energy for cooling and heating

"Energy poverty" refers to the "the inability of households to provide the energy needed for cooking, heating, cooling or lighting, at a level that meets basic needs" (Kriegel 2021). There is no official definition or measure in Israel, however several reports and research have dealt with the issue (Latet 2022, Teschner et al 2022). In some countries, the threshold to define energy poverty is "an expenditure share of energy of more than 10% while being below the relative poverty line ... after expenditure on energy" (OECD 2020).

Palestinians in Israel Source: Galilee Society 2017	Electricity (%)	Gas (%)	Heating fuel (%)	Total (%)
Households with insurances and benefits as main source of income	6.2	1.6	0.8	8.6
Household size 1-3	5.2	1.3	1.0	7.5
Household size 4-5	4.5	1.2	0.8	6.5
Household size 6-7	4.4	1.2	0.6	6.2
Household size 8+	5.1	1.2	0.6	6.9
North region only	4.7	1.1	0.7	6.5

## Energy expenditures as percentage of average monthly household expenditures

The way that the economic burden of energy consumption can impact individuals or households is complex. It may involve using an uncomfortably low level of cooling or heating, for example, which can go as far as to pose health risks. However, people may also choose to prioritize cooling or heating rather than other expenses. In this way, the physical need for cooling or heating may be (partially) met, but the resulting financial burden may restrict access to other necessities. Both of these phenomena can also co-exist in the same household.

The cost of electricity for air conditioning was raised by participants in several focus groups, some of which suggested subsidies as an adaptation measure. However, it is difficult to further characterize or quantify the economic burden of energy consumption in Shefa-'Amr due to a lack of data.

According to a Freedom of Information request, in Shefa-'Amr there are 51 Israel Electric Corporation (IEC) accounts that use prepaid electricity meters (IEC 2022). This could indicate an economic barrier to access to energy, as many of these meters were installed by the IEC when customers failed to pay electricity bills. However, households and businesses may also choose to install them for other reasons.

Note that three national policies may help cope with the economic burden of energy consumption. The first is a <u>electricity rate discount</u> for those with lower income, the second is an annual '<u>heating</u> <u>grant</u>' for lower-income or disabled elderly. Lastly, since a High Court of Justice ruling in January 2022 that regarding the constitutional right to electricity, many people of lower income are protected from electricity disconnection (<u>but not all</u> - Peleg 2022). There are no figures regarding number of electricity disconnections by locality.

Note that in addition to economic issues of access for those who are connected to the electricity grid, there are other issues of access to energy: see the section "Electricity infrastructure and access".

Intersectoral issues 6 - The economic burden of access to energy

Sources: Kriegel 2020<sup>74</sup>, Latet 2022<sup>75</sup>, Teschner et al 2022<sup>76</sup>, OECD 2020<sup>77</sup>, IEC 2022<sup>15</sup>, electricity rate discount<sup>78</sup>, heating grant<sup>79</sup>, Peleg 2022<sup>80</sup>



## Financial resources at the municipal level

The total municipality income of Shefa-'Amr in 2020 was 276,185 thousand shekels, of which 82.8% was classified as regular budget and 17.2% as irregular budget.

Per capita, the 2020 regular budget of Shefa'Amr is 28.1% lower than the national average (considering all local authorities).

2020	Shefa-'Amr	National (all local authorities)
Regular budget - % of total budget	82.8%	77.0%
Regular budget - revenue per person	5,378 shekels	8,121 shekels
Regular budget - % income from government	65.0%	44.7%
Regular budget - % general property tax collected	19.3%	32.0%
Residential property tax - % of total property tax	64.4%	50.1%
Residential property tax - collection tax rate including	24.7%	75.2%
charges due from previous years		
Residential property tax - collection tax rate only 2020	39.0%	69.6%
Irregular budget - % of government participation	71.8%	42.2%

Table 15 - Regular and irregular budget characteristics in Shefa-'Amr and in Israel, 2020

Source: CBS 3,81



Figure 38 - Income for regular budget

Source: CBS 8








Source: CBS <sup>8</sup>

Indicator	Data	Explanation & reference
Ministry of Interior Financial resilience index score 2020 (1-weak authority, 100-strong authority)	<b>35.73</b> (rank 110 out of 255 authorities)	2022 report <sup>82</sup>
Ministry of Interior 'differential index' regarding financial and administrative management 2021	<i>"Intermediate"</i> (but with accompanying accountant)	5 categories: robust; stable; intermediate; in 'efficiency improvement' program; in 'recovery' program <sup>83</sup>
Presence of "accompanying accountant" appointed by Ministry of Interior	Yes, since 2013	2022 Knesset report <sup>84</sup>
Ministry of Interior Human Capital Index	Not assessed (only 'robust', 'stable' and 'intermediate' authorities are assessed)	85

In addition to the above figures, here are a few Ministry of Interior indicators related to financial capacity:



This report cannot go in-depth in the municipal budgetary mechanisms and budgetary constraints specific to Arab localities, however we will summarize a few key points and comment on the situation of Shefa-'Amr specifically. The 2022 Sikkuy-Aufoq and Injaz is highlight recommended for a more detailed analysis and recommendations.<sup>86</sup>

**Regular budget:** It is already known that there are three main issues constraining regular municipal budgets in most Arab localities, which affect Shefa-'Amr as well (see table).

- 1. The relatively low rate of property tax collection, due several reasons (including the fact that residents have more tax discounts since many have lower income; and a lower enforcement capacity of the municipality). This issue is often perceived as the main constraint.
- 2. A lower amount of industrial and commercial activities take place in Arab localities, in part due to a much lower presence of industrial zones, which results in smaller tax base. Only 3.5% of industrial zones in Israel are within or adjacent to Arab localities. The Sikkuy-Aufoq and Injaz report concludes that this is the most important constraint to Arab locality budgets.
- 3. **Structural national issues** that result in Arab localities receiving lower budgets per capita from government mechanisms such as the 'balancing grant' and the 'disparity reduction fund'.

With regards to point number 1, the Shefa-'Amr 2014 municipal audit report assesses the use of a private company to perform tax collection. The report concludes that this has increased the municipal tax collection rate, but also raises various issues regarding the way the municipality contracts and monitors such companies.

With regards to point number 2, the first recommendation of the Sikkuy-Afeq and Injaz report is investing in employment and industrial areas. Another recommendation is to revitalize commercial areas in old neighborhoods. Several trends and initiatives in Shefa-'Amr are in line with these recommendations:

- **Privately-driven commercial growth:** As mentioned in the city profile, in recent years there has been significant commercial growth, for example at the western entrance of the city. This is not only good for municipal income but for the income of local business owners and employees as well. However, Shefa-'Amr ranked at the bottom of the 2021 'index of doing business' in its category of 'authorities of up to 50,000 inhabitants' (the index only assesses 75 localities).<sup>87</sup>
- **Urban planning-supported commercial growth:** The Tamal 1036 approved plan includes the development of a new employment/industrial zone in the east of the city.
- Tourism-driven commercial growth: The planned restoration of the fortress and investments in the old market as tourist sites may contribute to the revitalization of commerce in the old center – although results are still limited since the start of this work.
- Strategic development: In 2023 a new role was created in the municipality for the development of strategic management (financed and staffed by the "Cadets" צוערי צוערי program). This role is currently focused on employment and businesses, with the goal of further developing the local economy.



- **Resident fees for infrastructure:** Since the by-laws have officially been put in place a few years ago, the municipality now charges residents certain fees for infrastructure such as drainage pipes and public spaces. This is sometimes a condition to receive a building permit.
- **Regional distributive justice:** Recently the municipality has started receiving income from the the Hanaton mine, which is outside of the municipal territory but nearby (and exposes residents to environmental hazards). Discussions are ongoing regarding the possibility of similarly receiving income from Bazan Group in the Haifa bay area and the port of Haifa. Note that along the same lines of regional distributive justice, Shefa-'Amr will have to transfer 25% of income from the Tamal/1036 developments to neighboring locality Bir al Maksur.

**Irregular budget:** Since most of the regular budget is earmarked for specific purposes like education, welfare, municipal salaries and more, the irregular budget is important for urban development including parks and playgrounds, sidewalks, the renovation of the fortress, etc.

The primary source of irregular budget are governmental calls for proposals קולות קוראים defined for specific areas (some of which have been part of the GR 922 and GR 550 plans – see box). These can be significant sources of development – in Shefa-'Amr for example between 2020 and 2023 they have financed the development more than 5 new playgrounds, 5 new football and mini-pitch sports fields, and the restoration and development of 'Ayn Afiye' as a small park (see also table below).

However, there are barriers to win or to implement calls for proposals, such as capacity to write proposals or the requirement for matching financing from the municipality (see also the box '5-year plans'). Municipalities also do not know always know in advance which calls for proposals will be available in the next years, making it harder to plan strategically. Furthermore, there are sometimes delays in the provision of government funding – and according to a <u>report on barriers to budgeting for environmental issues in Arab municipalities</u> much of the funding is often provided only at the end of projects, requiring local authorities to cover expenses until then (Khamaisi and Ronen 2014/ Heschel, Injaz, Heinrich Boll Stichtung).<sup>88</sup> Finally, since these are top-down budgets, their conditions and requirements may not always match local needs and priorities.

In order to increase Arab localites' capacity in terms of resource development and resource utilization, the "Mawared (Resources) Initiative for Resource Utilization and Economics Development in Arab Local Auhtorities" was launched the JDC Institute for Leadership and Governance, the Ministry of Social Equality, the Authority for Economic Development of the Arab Sector, and the Ministry of Interior late 2019. Since 2021 this program finances a role of Resource Development "ממצה משאבים" in the Shefa-'Amr municipality.

Another source of potential medium-term independent income (or at least cost reduction) for municipalities is investment in solar panels on public buildings - see box "solar panels".

**Budget related to climate change preparedness:** Preparedness includes a wide range of measures, so the above sections on regular and irregular budgets are both directly relevant to the topic - see also the box on 5-year plans.



In addition to this, it is also important to mention that a number of municipalities, including Shefa-'Amr, have now received budget for the elaboration of local climate change preparedness plans. However, there has been no definition of budgets for the implementation of these plans.



#### 5-year plans for socio-economic development of Arab society

There have been two five-year plans aiming to enhance the socio-economic development of the Arab community in Israel: Government Resolution 922 (2016 – 2020, extended to 2021) and Government Resolution 550 "Takadum" (2022 – 2027). These were established "due to growing understanding of the depth of the gaps [between Jews and Arabs] and recognition that Israel's economy cannot sustain itself without Arab participation in the labor force" (IATF 2016).

High-level view of how these relate to climate change-related risk constructs:

Selected GR 922 and/or 550 topics	Relevant report section	GR 922	GR 550
Public transportation and pedestrian infrastructure	Exposure, Adaptive capacity (infrastructure)	Yes	Yes
Sports facilities	Exposure	Yes	Yes
Health (including focus on diabetes, obesity, mental health)	Sensitivity	Only for Nazareth hospitals	Yes
Welfare (including focus on elderly vulnerable to loneliness and social isolation; domestic violence)	Sensitivity	-	Yes
Local authorities' financial capacity (including income from industrial zones) and professional capacity	Adaptive capacity (financial capital, human capital)	Yes	Yes
Tourism	Sensitivity, Adaptive capacity (financial capital)	Only for Nazareth	Yes
Employment	Adaptive capacity (financial capital)	Yes	Yes
Financial inclusion (including access to credit)	Adaptive capacity (financial capital)	-	Yes
Urban planning	Adaptive capacity (institutional)	Yes	Yes
Emergency preparedness	Adaptive capacity (institutional)	Yes	Firefighting
Climate change mitigation (green buildings, solar energy)	Adaptive capacity (infrastructure)	-	Yes
Climate change preparedness (urban preparedness plans)	Adaptive capacity (institutional)	-	Yes

Key topics from within this report that were not included in either of the 5-year plans include flood risk assessment and urban runoff water management; urban cooling; agriculture; and access to electricity. Note also that, at least in Shefa-'Amr, it seems the financing of outdoor sports fields did not include shade (see also "Physical activity, climate and gender" box).

The analysis of the impact of GR 922 shows positive but mixed results, and GR 550 aims to address some issues that were identified throughout the implementation of GR 922.

Background information 7 - Government resolutions 922 and 550 and their relation to climate change risk constructs

Source: IATF 89–91



### Public indicators regarding financial and administrative governance

#### "Differential classification"

Since 2015, **five categories** were defined based on the local authorities' **budget balance and management of finances, HR and relation with municipal corporations**: 'robust', 'stable', 'emerging', 'intermediate', 'in efficiency enhancement program', and 'in recovery program'. Since 2019 there is also an '<u>emerging</u> authorities program'. Some authorities belong to more than one category, for example authorities in the 'intermediate' category who are also in one or more of the intervention programs.

- **Budget balance indicators:** whether the authority receives balancing grants, deficit rate, tax collection rate, salary expense rate, payload rate, financial and general manager expense rate,
- **Financial management indicators:** provision of support to CSO/NGOs according to criteria, cancellation of debts, audited financial report, property tax discounts attributed lawfully etc.
- HR management indicators: annual HR report, proper conduct
- Municipal corporations relations indicator: representation, discussion within LA council

Authorities classified as 'robust' or 'stable' may act more independently from the Ministry of Interior for defined areas – for example 'robust' municipalities are exempted from the need to obtain the permission of the Minister of the Interior to carry out real estate transactions.

Shefa-'Amr is classified in the "intermediate" category, however the fact that it has been appointed an 'accompanying accountant' technically excludes it from this category.

#### Ministry of Interior 'human capital' index

<u>Since 2020</u>, the 'human capital' index defined by the Ministry of Interior ranks local authorities in terms of their human resources conduct. Similarly as above, the municipalities who rank highly are given more independence in specific defined areas, in this case related to human resources.

The local authorities are ranked in **3 groups**: high index (90-100%), medium index (75-90%), and high index (0-75%). See 2023 ranking <u>here</u>.

Indicators include: submitting capital statements, personnel tender procedures, staffing statutory positions (incl. treasurer, legal advisor, city engineer), employee evaluation mechanism, etc. See indicators overview <u>here</u>.

Unfortunately, the Ministry of Interior only measures the 'human capital' index for 65% of municipalities – those that are 'robust', 'stable', 'emerging' and 'intermediate'. Because Shefa-'Amr is technically excluded from its 'intermediat' category, it is not included in this index, similarly to many Arab localities.

Background information 8 - Public indicators regarding financial and administrative governance



## Institutional capacity / governance

Institutional capacity can be defined in various ways. This section focuses on the municipality's institutional capacity, and defines it as the formal and informal characteristics (including rules, processes and practices) that allow, enable and encourage municipal actors to address collective challenges and realize objectives via decision-making and implementation. This can also be referred to as 'governance'.

In this case, the challenges are climate change risks, and the objectives are climate change preparedness, coping and recovery.

Dimensions of institutional capacity can include:

Authority and influence	to plan, design and	
Financial resources (see "financial capacity")	implement projects and	
Knowledge and professional capacity (see "human capital")	collective challenges	

This section first focuses on the subject of authority and influence, and then zooms in on the topic of governance related to flood prevention and to urban planning.

## Authority and influence – between municipal and national levels

**In Israel there are two levels of elected government**, both of which collect taxes: national and local. Few intermediary-level bodies are primary decision-makers – most of them are more administrative, such as health districts.

**Several sources describe the government system in Israel as highly centralized**, in a way that limits or "undermines the power of local authorities": "the prevailing idea in Israel is that local government is little more than an executive arm of the national government"; "*Local authorities* do exist, have responsibilities for municipal services, operate with varying levels of competence and respond to growing expectations. Nevertheless, *local government* – as a concept, ideal and sub-national political entity – lacks the necessary power, authority, legitimacy and resources that are required for meeting these responsibilities".<sup>92,93</sup> "In Israel, centralized control of the government ministries over what is done and the status of the local authorities is to a large extent like a "subcontractor" operating in various fields according to its instructions. At the same time, the local authority is an independent elected body by the residents and owes them an account for his actions."<sup>84</sup>

Primary decision maker	Domain		
Local authority	<ul> <li>Physical public infrastructure (street pavement, sidewalks, lighting parks playgrounds urban rainwater drainage<sup>1</sup> etc.)</li> </ul>		
	Mosto collection and dispessed		
	waste collection and disposal		
	Non-formal education		
Shared: local authority &	Education		
national body (policy	• <i>Ministry of Education:</i> curriculum; teacher qualification,		
decisions made primarily	employment of elementary and intermediary school teachers		
at national level, local level	Local authority: provision and maintenance of school		
primarily responsible for	buildings and equipment; employment of secondary school		
implementation)	teachers		

 Table 16 - Primary decision-making at different levels of government



	<ul> <li>Welfare</li> <li>Ministry of Labor and Social Welfare: welfare services policies</li> <li>Local authority: provision of services; employment of social workers</li> </ul>
Intermediary body	<ul> <li>Water and sewage: managed by 55 water corporations (Shefa- 'Amr is part of the "Sevev Shefaram" corporation)</li> <li>Urban planning: local and district planning committees (within framework defined by national planning authority)<sup>2</sup></li> <li>Environment: 52 local environmental units (Shefa-'Amr is part of the environmental unit "Shaar haGalil")</li> </ul>
National level	<ul> <li>Local tax rate range</li> <li>Healthcare</li> <li>Public transport</li> <li>Forests: managed by JNF/KKL or by National Parks Authority</li> <li>Municipal supervision (approval of budgets, approval of by- laws, approval of loans, etc.)</li> </ul>

<sup>1</sup> Non-urban rainwater drainage is managed by 11 drainage basin-based authorities

<sup>2</sup> Local planning committees may be specific to one locality, or may be shared between multiple localities. Shefa-'Amr is part of the 'Givaot Alonim' local planning committee.

Financially, the centralization of authority is illustrated by some key indicators (see table 15), and by the degree of financial dependence of local authorities on the government (see 'financial capacity' section). In terms of organizational authority, this can be seen in the decision-making distribution across different domains (see table 17).

Measures of decentralization	Israel	OECD	
Budget of local authorities	5.5% of GDP	11% of GDP	
% of local taxation determined	95.1%	7.8%	
by central government (2014)			
Governance decentralization	94 <sup>th</sup> out of global ranking with	Israel lowest in ranking out of	
index World Bank	182 countries	OECD countries	
Fiscal decentralization index	109 <sup>th</sup> out of global ranking with	Israel lowest in ranking out of	
World Bank	182 countries	OECD countries	

Table 17 - Measures of decentralization, Israel and the OECD

In the previous years, there have been some significant efforts pushing for the decentralization of powers, but these have had limited success – see box "Decentralization".

At the same time, there is still room for local authorities – and in particular for the mayor – to take initiatives, as mentioned in interviews. In line with this, one study states that "given the lack of central government clarity regarding the roles and responsibilities of the municipalities ..., mayors [in Israel] have a great deal of latitude in determining their specific areas of responsibility", although it specifies that this is sometimes done in 'semi-legal' ways (Uster et al 2022).

In the case of Arab localities, it is also worth highlighting the underrepresentation of the Arab community in national bodies. In 2020, 13.2% of civil service employees were Arab, and only 0.6% of these were in senior roles (IDI 2021).<sup>94</sup> This means that while the authority scope of the local authority is limited, the understanding and advocacy with regards to needs and preferences of Arab localities is also limited at national levels of decision-making. In parallel, regarding government companies, 12% of board members in government companies were



Arab, but only 2.58% of their employees were Arab. Arab political parties have also virtually never been part of the government ruling coalition in Israeli history.

## Authority and influence – within the municipality

Looking within Israeli local authorities, it is clear that mayors have more power than the local council. One report describes it as "the excessive power of the mayor... and the corresponding weakness of the [municipal] council", especially council members who are in the opposition (IDI 2020). Council members are not compensated for their work and only have access to very few resources.

The same report highlights the weak position of the municipal comptroller as well. In Shefa-'Amr, the 2011 municipal comptroller echoes this last point by mentioning that the role has no secretary, no influence on its budget, and that "most of the audit reports do not get attention from the municipal council and review committee". The same document reports that 6 out of 8 issues raised in the 2010 report were not fixed (1 was fixed and the other was partially fixed). Later reports do not provide updates on these topics.

The lack of influence of different departments on the budgets that they receive was also mentioned by several other departments in interviews.

## Authority and influence – public participation

**Public participation decision-making is considered to be a key element to good governance, in general as well as in the context of minority groups and of adaptation to climate change.** In Israel "although the central government … encourages local authorities to craft policies participatively, this is seldom backed by funding and is neither binding nor regulated. Consequently, it takes place mostly in localities that enjoy financial stability," and often via the use of external consultants.<sup>95</sup>

In Shefa-'Amr, according to focus groups and interviews, there used to be neighborhood committees set up to promote neighborhood priorities and concerns, however these are not active anymore. Apart from this, there have been few formal public participation processes relating to new projects and policies. Some exceptions include:

- The youth council which is elected every year and which mostly deals with school-related topics
- The development of the Master Plan included meetings with municipality professionals, religious representatives, a group of women, a group of teenagers, landowners, and the general public (results are described in three pages in the socio-economic appendix of the master plan).
- The new 'Muni100' age-friendly city project meets with a council of older adults every two months.
- The climate resilience project (which this report is part of) also emphasizes public participation via its research and community activities.



#### Decentralization: regional clusters and local authorities

For some years now there have been some efforts pushing for the decentralization of authority in Israel, which is today one of the most centralized countries in the OECD.

#### Regional clusters and "HaMifrats regional cluster"

Some of these efforts are focused on creating an intermediate, regional level of authority or influence between the national and the local levels of government.

One of these approaches is the "regional clusters", first established via a few bottom-up initiatives in 2016, and which provided a model for the others (Beeri 2020). Their goal is to encourage regional development, take advantage of economies of scale and promote cooperation between (usually neighboring) authorities.

**Shefa-'Amr is part of the the HaMifrats ("the bay") cluster**, which includes a number Jewish and Arab of municipalities that are close to the Haifa bay (but not Haifa itself).

HaMifrats cluster was part of the first set of municipalities to work on energy and climate change preparedness plan, as part of the 2021-2022 accelerator. The plan that it has produced includes a wide range of topics and activities (Eshkol reshuiot hamifrats 2022).

However, the cluster has no budget specifically allocated to the topic of climate change preparedness. Furthermore, based on an interview, it seems its goal is to become financially self-sufficient, meaning that it currently focuses on revenue-generating opportunities such as solar power or waste management, which are more related to climate change mitigation than preparedness.

#### Decentralization of powers/authorities towards local authorities

Other decentralization efforts are focused on increasing decision-making and independence at the level of local authorities. In November 2021, government decision 675 was passed regarding "decentralization of powers to the local government and reduction of excess regulation", and by October 2022 there was significant progress in terms of recommendations in different ministries (and a start in implementation for some measures) (Lerer 2023). However, the proposed 'Arrangements Law' that is currently in debate (April 2023) would put a stop to most of this process (Topichiashvili 2023).

It is worth noting that the Ministry of Interior had defined a "differential decentralization" plan (Ministry of Interior 2022). Five of their proposed decentralization measures would apply to all local authorities, e.g. the ability to open a bank account, to changes in the property tax decree of the local authority, and to pass a certain type of by-laws, all without having to request Mol approval. However, seven other measures would only be fully deployed to local authorities considered financially stable and in compliance with administrative rules – amounting to 20% of local authorities. Another 19% of authorities would benefit from 'partial decentralization', while for 62% of authorities these seven measures would not apply.

Most – if not all – Arab authorities, including Shefa-'Amr, would have been in the category of local authorities for which these seven measures would not apply.

Background information 9 - Decentralization: regional clusters and local authorities



Explanation box 1 - Decentralization: regional clusters and local authorities

Sources: Beeri 2020<sup>93</sup>, Eshkol reshuiot hamifrats 2022<sup>96</sup>, Topichiashvili 2023<sup>97</sup>, Ministry of Interior 2022<sup>98</sup>, Lerer 2023<sup>99</sup>

There are also cases where residents have organized to advocate for certain needs and priorities, such as establishing a local park or setting up a food waste reduction initiative – however this requires strong advocacy efforts, rather than the ability to leverage established public participation processes.

It is important to highlight that public participation efforts may be hindered by perceptions of the public. In focus groups, many participants expressed distrust in the municipality, including concerns related to corruption. This may affect some people's motivation in participating in processes led by the municipality.

**Public participation requires transparency towards the public.** Shefa'-Amr scored lower than average (34% compared to average score 37%) on the Lawyers for Good Governance Transparency Index 2022, which assesses transparency of Arab local authorities via data presented in municipal websites.<sup>100</sup> It also scored poorly on a national transparency index of local authority websites (in the bottom 10 out of 121 authorities).<sup>101</sup>

#### Governance: the case of flood prevention

For a more comprehensive overview of issues related to flood prevention, please see the State Comptroller 2021 report chapter on protection against flood damages.<sup>102</sup> Here we highlight a few key points and how they relate to Shefa-'Amr's situation.

**Regarding authority, there are known issues with regards to the definition of responsibilities between stakeholders on the matter of flood prevention.** A 2018 study states, "responsibility for drainage is vaguely divided between [the 11] regional drainage authorities and 'islands' of local authorities and municipalities responsible for urban drainage within them. The result is that coordination relies on goodwill cooperation between different authorities with different interests".<sup>103</sup>

Along the same lines the 2021 State Comptroller on report on flood prevention states: "Actions to reduce flood damage, for years, [have] been carried out mainly by local authorities and drainage authorities ... . The audit also found that there is no single regulator dealing with the issue of runoff, and that the issue is distributed amongst many government and local authorities with different interests and priorities. As a result, over the years, deficiencies have accumulated in the drainage infrastructure in Israel. Moreover there is a need to examine the allocation of resources to bridge the gap between needs and resources." <sup>102</sup>

Apart from the lack of a single body leading the topic of runoff, there is another issue in terms of authority and responsibility. "The Israel Water Law determines that all the water in the country, above as well as below ground, is a public resource controlled by the state. ... Yet public ownership [and centralized control] of all water in the country is a barrier for local entities wishing to infiltrate or extract water for stormwater management who need special permits to do so" (see also box "rainwater harvesting"). <sup>103</sup>



	Conventional urban drainage	Sustainable stormwater management
Attitude	To be controlled and removed;	A valued resource for humans and nature;
towards	designed to handle extreme	handling all stormwater events; living with
stormwater	stormwater events	water
Goals	Avoiding flooding; avoiding	Multiple goas: (1) water-related e.g. flood
	sanitation risks (in cases with	migitation and adaptation; (2) ecological e.g.
	combined sewage	protect water-based ecosystems; (3) social
	infrastructure); reduced	e.g. improve urban quality of life; (4)
	topsoil erosion	economic e.g. reduce infrastructure costs
Measures	Rapid removal of urban runoff	Slowed runoff conveyance; detention,
	by constructed channels	retention and infiltration of runoff;
		integration with conventional drainage as
		needed
Professional	Drainage engineers work	Cooperation from initial states between:
roles and	alone, after land-use planning	urban planners, architects, drainage
work	and architectural design	engineers, landscape architects, ecologists
process		

Conventional drainage vs. sustainable stormwater management



Background information 10 - Sustainable stormwater/runoff management

**Regarding financing, as mentioned in the 'infrastructure' section, neither the municipality nor the drainage authority have sufficient budget dedicated to large flood prevention infrastructure investment**. The State Comptroller report states "The government budget intended to support the drainage authorities, totaling NIS 550 million for ten years, was set in 2010 and does not reflect current and future drainage needs affected by urbanization and weather changes estimated, as of 2019, at NIS 6 billion." <sup>102</sup> Specifically for the Kishon drainage authority, the report indicates that the cost required to carry out all the required drainage projects 2019-202 is more than 192 million shekels.

In order to overcome this severe budget limitation, drainage infrastructure investments typically leverage the budget of new development – however this leaves areas that are already developed behind. The issue of developed areas being left behind also finds echo in the new Ministry of Planning surface runoff management policies, which assign responsibility to manage surface runoff to every significant new construction.



**Regarding knowledge and professional capacity**, at the national level, the new policies for the management of urban runoff, promoted by the National Planning Division of the Planning Administration further institutionalize a significant evolution in approach with regards to drainage and water management that has been going on for over a decade. In 2018, a couple of years before the publication of these new policies, a study summarized that "there is a general consensus among researchers and practitioners that the implementation of 'sustainable stormwater management' in Israel lags behind available knowledge".<sup>103</sup> The administration has been actively disseminating the new policies via written guides, online webinars – still, it will take time. As mentioned in the "adaptive capacity – infrastructure" section, the master plan drainage appendix does provide high-level guidance on urban water retention, but it hasn't been applied.

At the level of Shefa-'Amr, there is no hydrological engineer nor urban planner in the municipality. In focus groups there were one or two comments focused on how drainage pipes need to be widened, which reflects the more conventional view on drainage management. This is not surprising since these were not water or planning professionals, but it raises the point that raising awareness among the general public may help the overall 'socio-technical' transition.

At the level of the drainage authorities, "informants from national-level agencies noted that the drainage authorities could be a significant actor in promoting Sustainable Stormwater Management but several of them currently lack the professional leadership and resources to fulfil this role while a Drainage Authority representative noted that the proposed changes to the law were needed to provide the authorities with more tools".<sup>103</sup>

Another issue regarding knowledge is the lack of flood risk mapping. The drainage master plan as well as the drainage appendix in the master plan do not include flood risk mapping. One partial way to address this could be to look at historical records of flood events and damages – however there are no such records either. The Kishon Drainage Authority received a budget of 2.1 million shekels to perform a flood risk assessment in 2023, however it is unclear whether this will include urban areas. Also note that the new national flood forecasting center does not assess urban areas.



## Urban planning, climate-related risks and public space

Several issues connect climate-related risks and urban planning. One key issue is public space, including sidewalks. In the focus groups, participants mentioned a decrease in physical and/or outdoor activities during very hot days (see quotes) – this makes sense and also follows health recommendations to avoid prolonged exposure to high temperatures.

However, at the same time, we know that walking outdoors can have positive health effects. Urban planning can help enable this by making outdoor daily activities more accessible, safe and pleasant, even in relatively hot weather.

Торіс	Report section (risk factors)	Relevance of urban planning
Walkability features (sidewalks including benches, shade, evening light, etc.) that promote physical activity and social interaction even during hot weather	Exposure (pedestrians), Sensitivity (health)	Space for sidewalks and features like benches, shade, evening light, etc. requires space, which is often tight in older neighborhoods (built without planning / without using 30% of lots for public use). Also requires parking / car reduction solutions, otherwise cars park on sidewalks.
Green/shaded public spaces e.g. parks, playgrounds that help cool the city and promote physical activity and mental health	Exposure, Sensitivity (health), Box "Physical activity, climate and gender"	Public spaces require space, which is often tight in older neighborhoods (built without planning / without using 30% of lots for public use).
Public transport (shade at bus stops – but also public transport can promote walkability and decrease car needs)	Exposure (shade at bus stops/ pedestrians walking to bus stops)	Buses and bus stops require minimum space, which is often tight in older neighborhoods.
Access to electricity for cooling and heating	Adaptive capacity (infrastructure)	Connection to electricity network depends on regularization of houses built without permits, which in part depends on urban planning processes (detailed plans).
Risk of floods from surface runoff	Adaptive capacity (infrastructure), Box "Conventional drainage vs. Sustainable water management"	The (unplanned) increase in built-up area and impervious surfaces, including in what used to be natural streambeds, may increase surface runoff. On the other hand sustainable stormwater management with the planning system as an integrator can mitigate flooding and support urban nature, possibly reducing irrigation expenses (Goulden et el 2018).
Commercial and industrial zones	Adaptive capacity (financial)	Commercial development depends on planning allowing commercial activities, via commercial zones as well as mixed-use zones.

Table 19 - Urban planning and climate-related risk factors

Intersectoral issues 7 - Urban planning, climate-related risks and public space in Arab localities



Focus group participants – Heat and outdoor activity

"All the day we are at home, we sit in the A/C."

"Basically, with the heat no one goes outside the house."

"If we need to go out, **we wait until the afternoon**, or in the morning, and we go. And we don't go in the middle of the day when it's very hot. We go in the afternoon, like in Egypt, they don't go out and don't buy things [during the day], they change the day to night and the night to day, all the stores are open in the night. So you go around during the night and sleep in the day."

"In the heat, I don't go out, if I want to go to the sea sometimes, only after 4pm, staying until 7 or 8. But in the heat I don't go out at all."

"From my side, all the stores, macolet, meat, everything is close to my house, so I just go (kofetset) there by foot. I don't have to bother myself or go to places faraway, everything is close by me. And if I don't go out, then my husband brings it to me. And I don't work, I'm a housewife, so I don't need to leave the house."

"There are also no benches, which may be needed **if a woman is walking and needs a rest**. Maybe she has a [medical] test, and no [driving] license. It's not possible to walk. She can't take a break, somewhere to sit. Why are there benches in many other places? Only in Shefa-'Amr there aren't."

"If now [March 2022] my son wants to walk to school, I allow him. But in the summer no ... I drive them. ...in this current weather, for another week or two, the boy wants to walk, because it's a **10 minute walk**, so there's no problem, he wants to and I want him to and it's all good. But when it's hot I don't want him to and he also doesn't want to."

Quotes 8 - Heat and outdoor activity

#### Governance: the case of urban planning

For a more comprehensive overview of issues related to urban planning in Arab localities in Israel, several reports are available – see the works of the Alternative Center for Arab Planning, Sikkuy-Aufeq, and Prof. Rassem Khamaisi. A good summary in English is also available from the Inter Agency Task Force on Israeli Arab Issues (Urban Planning in Israel's Arab Communities, 2020). <sup>104</sup>

Urban planning is one of the most complex issues for Arab localities. It was "by far the most significant barrier to overall implementation" of the GR-922 plans, and may also be a key challenge in adaptation to climate change.

**Regarding authority**, the urban planning framework has several layers, each with their own authority, but operating within a top-down national framework.:

- 1. The national level performs national zoning and land allocation
- 2. Regional plans are developed by six district committees
- 3. **Municipal 'master' or 'outline' plans** outline zones and roads for a municipality or a neighborhood they are usually developed by the municipality and/or the district committee, and need to be approved by the district committee
- 4. **Detailed plans** detail out exact planning and construction instructions for neighborhoods, development projects or other small areas they are usually



developed by the local planning committee (or by the district committee if there is no local committee)

Crucially, building permits can only be emitted on basis of detailed plans, and detailed plans require (1) an approved master plan, (2) proper land registration for private land.

Shefa-'Amr, like most Arab localities, does not have its own local planning committee. Instead, it is part of the 'Givat Alonim' local planning committee, together with 4 other localities which are also Arab: Abelin, Kfar Manda, Kawkob Abu al-Hija and Bir al-Maksur. IATF 2020 mentions that "this dependence on regional bodies perpetuates the professional and planning weaknesses in Arab localities", and Khamaisi 2016 also recommends that municipalities of more than 20,000 would have their own local planning committee. However, note that since 2014 the mayors of Shefa-'Amr have been the chairmans of the committee, so the needs of Shefa-'Amr might be fairly well represented.

As mentioned in the general section on authority and influence, there is also a challenge of Arab representation within the urban planning governance structure: "in the Northern District Committee, only one of 17 members is Arab, representing 6% of the committee, while Arab citizens represent around 50% of the community served by the District Committee." (IATF Feb 2020)

Most Arab localities are primarily composed of private lands (as opposed to the rest of the country). Most Arab localities grew without master or detailed plans (today, in part related to GR-922 efforts, this has improved – the Shefa-'Amr master plan was approved in 2021). This has been a key barrier to provide building permits, which is the cause of houses not being able to be legally connected to the electricity network (see "Infrastructure capacity"). Another important issue is that, legally, local authorities as well as bodies like the Electrical Company are allowed to "confiscate up to 40% of private plots without compensating owners (assuming owners will benefit from the planned public services, which will also raise the value of the remaining plot)" to provide public services – including sidewalks, parks, etc. However since most building happened without planning in Shefa-'Amr, like in other Arab localities, people did not reserve part of their lots for such use, and many are already fully built-up. This is difficult to address retrospectively.

This lack of space is a concern for housing, however it is also an issue for public space. For example, there are plans for cycling and walking paths as part of the 'Authorities of change' partnership with the Ministry of Transport. However, these are mostly planned for the outskirts of the city, probably because it was easier to find space there (see figure 12). While some of these paths present interesting advantages, they will probably not provide the full possible benefits mentioned in table 10 (see also "walkability and junctions density" box).



Figure 41 - Bicycle/footpaths planned for Shefa-'Amr



				<i>c</i>		
Table 20 – Possible	health	henetits	and harms	of outdoor	(dailv)	activities
		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		0,00,000,	0.0	0.00.00

Possible benefits	Possible measures		
Most people don't perform enough physical activity. Walking for leisure as well as walking as part of daily activities such as going to school or going to the store can be good ways to <b>perform</b> <b>more physical activity</b> .	<ul> <li>Enhancing walkability, including within neighborhoods around people's homes and for daily destinations, and not only for leisure walking paths in outskirts:</li> <li>Older people might not be able to drive to take a walk</li> </ul>		
As mentioned in the "Loneliness and social isolation" box, being outdoors can be one way of <b>interacting with people</b> , if it involves passing by areas of passage such as shops, cafes, parks, and even benches.	<ul> <li>Daily destinations like school and errands can promote daily physical activity (rather than once-in-a-while leisure)</li> </ul>		
Exposure to nature can contribute to our mental health via stress reduction as well as contribute to cognitive performance	Enhancing green and natural elements throughout the city, including trees and plants (also in private spaces)		
Possible harms			
Prolonged exposure to heat is a health risk factor, especially for people with underlying medical conditions as well as older and younger people	<b>Enhancing shade</b> as well as resting spots, public water foundations. <b>Outdoor lighting</b> to allow people to walk in the cooler evening hours		
Road accidents and walking accidents (e.g. tripping due to an uneven floor, which is more likely for elderly people and others who are less stable)	Enhance accessibility and pedestrian safety, especially considering older people, people with handicaps, and children		
Crime and fear of crime can harm people physically and mentally	Enhancing public safety*		

\*The issue of crime is of course complex and out of scope of this report. However it is still important to acknowledge that it is another factor that may be relevant. See box "Public space and crime"

**Regarding financial resources,** this is perhaps less significant in terms of urban planning – however the implementation of planning, such as the building of public spaces, of course depends on financial resources (see "financial capacity").

**Regarding professional and human resources**, various reports highlight lacks in professional capacity in Arab localities in general with regards to urban planning, e.g. Khamaisi 2018: "lack of administrative, budgetary and planning preparation in local authorities for developing public spaces. Local authorities should be empowered administratively and financially by strengthening their engineering and planning divisions". In Shefa-'Amr, there is neither urban planner nor a landscape architect working for the municipality. However, there is a 'Shefa' (beautification) department, which currently includes one of the two 'cadet' אנארים.

With regards to human resources in the Givat Alonim planning committee, a 2016 audit raised the issue that "The committee did not make sure that the candidates for the jobs produced all the necessary documents for their employment - about their education, their experience, their skills and their suitability for the position. The personal files of the employees were missing essential documents." However it does not say that employees are not qualified for their jobs. It also mentions that "the committee delayed hiring a legal advisor and a prosecutor for about a year.



#### Public space, crime and littering

The analysis of how urban planning connects to climate-related risks puts a large emphasis on public space – including sidewalks, parks and playgrounds. Unfortunately it is not possible to talk about public spaces without talking about crime.

According to the number and rate of murders between 2018 and 2020, Shefa-'Amr is not one of the localities with the highest rate of criminal violence – but there were still 6 murders in these two years. There was another murder in 2022 and several shooting incidents. The same year, in neighboring Bir-al-Maksur, a child was killed by a stray bullet in a playground.

In that context, it is no surprise that 79.2% of respondents of our 2022 survey indicated that they were "very worried" about crime and violence.

Apart from the threat of criminal violence, the issue of vandalism is also important relative to public space, together with public littering. Often, when people discuss the possibility of adding bus stops, benches or playgrounds, they mentioned the likelihood of vandalism. In our documentation of public spaces, we found both playgrounds and sports fields with broken glass on the floor. This means that not only is it challenging to plan for public space, it is also challenging to maintain it usable and safe.

Of course these are complicated issues, but it is important to consider them when planning public spaces as part of adaption to climate change measures. Otherwise, spaces might be designed but not used, which does not fulfill the goals of adaptation.

Participant quotes:

"Our children, our grandchildren, they come and break everything that the municipality installs [in public space]"

"The garbage they throw in the streets. ... When you walk on the street, you feel disgusted."

Intersectoral issues 8 - Public space, crime, littering

## Infrastructure and technology capacity

#### Health and social services infrastructure

Health and social security services promote resilience and climate resilience. In the event of an acute health event such as heatstroke, cardiac event, stroke or heat-related COPD exacerbation, the availability and accessibility of health services such as ambulance, emergency room (especially with cardiovascular services), and rehabilitation increase the ability to cope with and recover from the event.



Chronic disease prevention and management services are also important to reduce sensitivity factors such as heart disease, diabetes, etc. Social security through the National Insurance Institution provide a certain level of financial support to people with low income or who are unemployed, children, senior citizens, disabled, frail elderly, etc.

Welfare services can also contribute to climate resilience, through prevention of loneliness in older citizens (see box 'Loneliness and social isolation'), prevention and support in cases of domestic violence (see 'Violence'), etc.

Every citizen and permanent resident of Israel has national health insurance and social security. The Shefa-'Amr distribution of insured by health fund is as follows: 55% Clalit, 30% Maccabi, 11% Meuhedet, 2% Leumit.

Public health		Hospitals and		
and special	Clinics	emergency	Long-term care	Welfare services
programs		medicine		
- Health	- Clalit (2)	<u>Hospitals</u>	Nursing home	<u>Governmental</u>
promotion	- Maccabi (1)	- Haifa, 3+	- <u>Retirement</u>	- National insurance
coordinator,	- Meuhedet (1)	- Nazareth, 3	<u>home Ahuzat</u>	- Welfare department
and soon part of	- Leumit (1)		haTsafon	(including center for
pilot	- Private (many)	Emergency	Moriah Group	treatment and
municipalities to	- Mother and	<u>medicine</u>	(187 beds)	prevention of family
have a public	child 'tipat	- Hana	- <u>Geriatric</u>	violence)
health	halav' clinics	ambulance	<u>center Alanaya</u>	- Early childhood
department		- Maccabi	(115 beds)	center
Puscoll Porrio	<u>Mental health</u>	emergency		- Youth center 'Masar'
- Russell Berrie	- Mental health	medicine center	Mental health	(18 - 35)
	center Clalit	Kiryat Motzkin	- <u>Al Yasmin</u>	- Employment services
initiativo	- Children and	- Clalit	center for	- Boarding school
miniarive	youth mental	emergency	mental health	<u>'Aman'</u> for teenage
- Muni100	health center	medicine Kiryat	rehabilitation	girls at risk
'optional aging'	Clalit	Bialik, Tamra		
initiative			- Hostel 'Sanad'	Governmental
LIDEO program			for day center	financing with
for agos 60+			for people with	participant
IOI ages 00+			mental	<u>contribution</u>
- Climate			disorders (age	- Community centers
change			30+)	(4)
resilience				- 'Mofet' elderly club
project				- Association for the
				elderly (day center,
				'supportive
				neighborhoods'
				program, etc.)
				Associations
				- <u>Akim</u> , for people with
				mental disabilities

Table 21 - High-level mapping of the availability of health and welfare services in Shefa-'Amr

Availability of health services



Shefa-'Amr Ministry of Health's indicators for localities with more than 25,000 inhabitants seem to indicate that Shefa-'Amr has a relatively good availability of services (January 2023 data):

Medical services	Hours of service	Decile, 10 <sup>th</sup> decile represents	
	per week per 1,000 insured	highest availability of services	
Family medicine	26.0	9 <sup>th</sup>	
Pediatrics	28.0	7 <sup>th</sup>	
Gynecology	11.3	9 <sup>th</sup>	

Note: These numbers are based on hours published on the health insurance websites and have some important limitations<sup>105</sup>, including:

- The information on the health fund websites does not fully reflect doctors' actual operating hours
- The information on the health fund websites does not include services provided as part of hospital outpatient clinics
- An independent doctor who has agreements with several health funds and provides treatment to patients from different health funds during the same hours actually devotes fewer hours to each health fund
- Some family doctors also treat children in addition to adults

Therefore, the hours and decile rank may not be completely reliable as indication of relative availability. For example, if there is a significant number of independent doctors in Shefa-'Amr, then the number of hours is probably lower than the data provided. Furthermore, because cities with hospitals have uncounted hours from outpatient clinics, it is possible that Shefa-'Amr is in a lower position in the ranking relative to these cities.

Source: email exchange with Ministry of Health<sup>106</sup> (an older version of this indicator from 2018 is available online<sup>107</sup>).

In the focus groups, we did not specifically ask about accessibility to health and welfare services, but a few comments came up that relate to this topic the lack of services for those with (mental) disabilities, including adults with disabilities.

#### Access to health and social services for non-citizens

It is important to note that there are probably residents without citizenship in Shefa-'Amr, whose access to health, social security and welfare is highly problematic.

- For residents in the process of family reunification, access to health insurance and social security depends on their specific status (Visa B1, A5 or DCL permit היתר מת"ק).
- Residents without status (without citizenship, permanent residence, or visa) have significant barriers to access to health services and no access to national social security.
- There are no reliable numbers regarding people without status at the national level, nor at the district or Shefa-'Amr level specifically. The estimates speak of "thousands of people" overall, including for example Palestinians from the Occupied Territories who married Israeli citizens (probably most of them women, but not only).<sup>108,109</sup>. Therefore, it is possible that some of them live in Shefa-'Amr.



In Haifa <u>VeAhavta Clinic</u> serves people without status, however as a not-for-profit clinic that operates almost entirely on voluntary basis and depends on donations for its operational costs, its capacity is limited.

#### Electricity infrastructure and access

Access to electricity is of course essential in modern life. In relation to climate resilience, electricity is required to power cooling and heating technologies, which enable coping with extreme heat and cold.

#### National and municipal level

**Overall, recognized localities in Israel including Shefa-'Amr have a stable source of access to electricity.** Israel reports that 100% of the population of have access to electricity to the World Bank Global Electrification Database, ignoring unrecognized localities.<sup>110</sup>

However some sources have pointed out risks of excessive load on the electricity network during times of peak demand such as heat waves as well as concerns that heat itself reduces production capacity.<sup>111</sup> In contrast, it seems that the electricity authority does not consider "climate change as a factor that affects demand for electricity".<sup>19</sup>

In addition to this, small and large shocks can cause shorter or longer breaks in electricity provision, which cause many types of disruptions, including heat- and cold-related health risks if they take place during a period of extreme heat or cold. Such shocks include more local events like damage from a fallen branch or malfunction in a specific power plant, to lower frequency but higher impact risks like national security risks or the risk of earthquakes.

#### Household level

At the household level, barriers to access to electricity in localities like Shefa-'Amr are not related to infrastructure, but to poverty (see box "Energy poverty") or to policies related to the construction of houses without permit.

Houses build without a permit may not legally be connected to the electricity grid, although some situations have been granted exceptions to this rule in the past decades.<sup>112</sup> One of the reasons for which people have built houses without permits is due to the lack of 'detailed plans' in Arab localities. 'Master plans' provide a useful strategic planning overview for localities, however building permits can only be issued based on 'detailed plans', which require complex and time-consuming processes from the municipality.

To overcome this, people who have built houses without permits install cables themselves that illegally connect to the electricity grid. This can be physically dangerous, causes cuts and surges in power, and also makes it more difficult for the electricity provider to manage electricity demand. Alternatively or additionally, some households also use costly and polluting fuel-based generators, or solar panels.

In January 2022 the 'Electricity Law' was passed among great political controversy, in order to allow the connection of buildings built without a permit to the electricity grid. However a December 2022 article reports that despite "80-100 inquiries every week" to the IEC, "only 16 requests ... have been submitted to the outgoing Minister of the Interior ... [and] of these only 3 requests were approved", due to overly strict conditions regarding the building as well as



requiring a guarantee deposit.<sup>113,114</sup> In parallel, the article reports that there is right-wing lobbying to repeal the law.

According to a survey by Sikkuy-Ofek and the Arab Center for Alternative Planning, in 2018 there were 165 buildings without permits in Shefa-'Amr, located at the northwest, southwest and eastern edges of the built-up area (excluding light construction such as sheds).<sup>115</sup> Out of these, it is not known how many are not legally connected to the electricity. At the same time, a February 2022 Knesset report on the topic connections to the electric network estimates that in 17 Arab localities in the north of Israel, 25 to 68 percent of connections may be illegal - however Shefa-'Amr is not one of the assessed localities.<sup>116</sup>

Although housing regularization processes are ongoing via approvals of detailed plans, this is expected to take a couple of years at best, during which households remain without a legal connection to the electricity grid. This may limit their ability to cope with high/extreme heat and cold.

It is possible to speculate that owners of houses who are not legally connected to the electricity grid have more motivation to invest in solar panels (see below), which could actually increase their energy resiliency in case of a major issue at the national or regional level.

#### Air conditioning

It is very clear from the focus groups that the primary method of coping with heat is the use of air conditioning – which of course requires electricity (see above).

The rates of availability of air conditioner going from 34.9% of Arab households in the north in 2004, to 87.3% in 2017 show a true revolution, although the increase has been significantly slower than the national average.

Year	The Ga	CBS (national)				
	South	Center	Haifa	North	Total	
2017	74.4%	98.0%	86.7%	87.3%	87.2%	92.0%
2014	39.0%	89.8%	82.1%	76.7%	74.6%	86.6%
2007	30.0%	46.0%	37.5%	43.8%	42.1%	70.5%
2004	17.8%	59.2%	-	34.9%	35.7%	65.8%

Sources: The Galilee Society surveys<sup>117–119</sup>, CBS הבנסות והוצאות משק הבית, למ"ס

See also 'energy poverty' box.



#### **Solar panels**

Solar panels typically relate more to the topic of climate change mitigation, however they can also relate to adaptation in three ways:

- They can increase the incentives/ help finance the building of shade facilities that would protect public sports fields or playgrounds from extreme heat
- They can be a source of private and municipal cost-saving and income, thereby increasing financial capacity
- Of course, for buildings that are not connected to the electricity grid (e.g. in unrecognized villages), they provide electricity

In a 2021 IDI survey, 48% of Arab respondents indicated that financial assistance would be the factor that would most enable them to install solar panels at home, while 30% indicated that they would need a better understanding of the benefits. A 2020 Heschel survey also found that financing and knowledge were the two important factors both at municipal and private level. 9% of respondents to this survey also indicated that the lack of suitable roof surfaces was a barrier, due to plans of eventually building an additional floor onto an existing building. Issues of trust in authorities like the Ministry of Energy, Electricity Authority and Electric Company were also raised. Finally, at the municipal level, the lack of open spaces was also mentioned as a constraint.

In Shefa-'Amr over 30 private buildings have solar panels, mostly private houses, as identified by Govmap satellite imagery. The municipality expects to have solar panels on its first public building within 2023.

Note that, with regards to roofs, another adaptation strategy that can contribute both to heat reduction and water retention is the use of green roofs. They do not provide energy savings or income in the way that solar panels do, however they are more financially accessible, and can be a community resources if used as community gardens.

Background information 11 - Solar panels

Source: IDI survey 2021<sup>120</sup>, Heschel survey 2020<sup>121</sup>

## Stormwater / surface runoff management and flood prevention infrastructure

Stormwater management infrastructure is key to prevent flooding. The municipality has taken and continues to take several measures to improve stormwater management, as illustrated in the map below. However, there are still several known challenges in the current infrastructure, which lead to regular flooding in the built area, as reported in the master plan and in the focus groups (see also "exposure" section).

#### 1. Lack of consideration for streambed buffer zones

The master plan indicates there should be 50m buffer on each side of streambed. In practice, construction hasn't necessarily considered the original course of natural streams, which this has disrupted the water runoff flows.

#### 2. Very partial implementation of upstream regulation plans



According to the Shefa-'Amr drainage master plan from 2009, which is referred to in the municipal master plan drainage annex of 2015, four areas were planned to have regulation basins in order to curb peak flows into the different Shefa-'Amr streams.

Area	<b>Regulation basins</b>	Target stream	Status
number	planned		
Area 1	2 basins (45 dunam, 75 thousand m <sup>3</sup> according to 1:10 return period)	Shefa-'Amr stream (Wadi el Saqia), south/Efrat stream	Detailed plans published in 2011, but not implemented. Instead, regulation terraces were built in the area.
Area 2	2 basins	Shefa-'Amr stream (Wadi el Saqia), north/quarry area	Not implemented
Area 3	1 basin (35 dunam, 50 thousand m <sup>3</sup> )	Hanaton stream (Wadi Abu Afen)	Not implemented. East neighborhood development plan Tamal 1036 includes a regulation basin to be created covering 10 dunam for a return period of 1:100 years (see 5.6.1 of drainage appendix)
Area 4	1 basin	Shafron stream (Wadi al Fawar)	Not implemented

 Table 23 - Planned regulation basins, Shefa-'Amr drainage master plan 2009 and master plan 2015
 Image: Comparison of the second sec

The main challenge to implementation of the planned basins is the lack of budget (see "Institutional and political capacity"). There are no cost estimations for the basins outlined in the master plan, but according to interviews the cost can go from tens of millions of shekels up to 100 million shekels.

In general, neither municipalities nor drainage authorities receive specific budgets for the implementation of such plans, which are therefore often not implemented. In the case of municipalities of lower socio-economic status, it is even more challenging to find funds for such investments. Note also that this kind of infrastructure is largely invisible to the public, as is often the case with prevention measures, perhaps reducing its political attractiveness. In this context, such infrastructure is often financed by leveraging the development of other kinds of infrastructure, such as the building or expansion of a highway, or the development of a new neighborhood. For example, in the center of the country the Israel Land Authority (מקרקעי ישראל) regularly finances this kind of infrastructure via their projects.

As such, it may be that the basin included in the eastern neighborhood plan will be financed via the bodies financing the overall development of the neighborhood, such as the Ministries of Housing and of Construction (financing the development of the residential area) and the Ministry of Economics (financing the development of the the industrial area). This would be in line with the new national policies on runoff management which require all major construction to manage the runoff that it will create.





איור 8 - סימון אגני ויסות מתוכננות מתכנית אב לניקוז (במעלה נחלים שפרון, חנתון ושפרעם) Figure 42 - Drainage master plan from 2009, as included in the 2018 Master plan drainage appendix

## 3. Insufficient volume of drainage pipes

## 4. Partial dealing of blockages of rainwater drainage pipes and street-level gutters

Apart from the physical size of the drainage pipes, blockages of the pipes and street gutters also limit their capacity. Sources of blockages include organic waste (e.g. leaves, sticks) as well as garbage from the streets, some of which enter the drainage pipes, and some of which block the street-level gutters.

The municipality undertakes a cleaning operation before the winter season every year, as documented for 2020, 2021 and 2022. It also encourages citizens to clean street-level gutters via social media.

# 5. Lack of application of surface runoff water management principles (public and private spaces)

Both the drainage appendix of the master plan (2015) and the east neighborhood plan drainage appendix (2016) refer to water retention, containment and percolation. The master plan provides examples such as permeable green ground cover in low-lying areas and water



retention and runoff regulation facilities in built-up and parking areas (see section 12 of the master plan drainage appendix). However it appears that such measures have not been applied in public spaces.

These measures are not restricted to public spaces – they can be applied in private gardens and yards as well. There is no specific data about this, however anecdotally such spaces are becoming increasingly covered in impervious materials such as concrete and asphalt, as this provides parking space for cars, and may be considered easier to clean and maintain.

### 6. Drainage of home gutters into the sewage system

The previous issues are mostly public issues, apart from the potential for individuals to contribute to gutter cleaning and to preserve permeability in part of their yards. This issue relates more to private houses which connect their roof gutters to the sewage system instead of letting the water spill out into the yard or the street. Connecting private gutters to the sewage system is not legal, however according to interviews it is a common practice in Arab localities.

The issue that this creates is a peak in volume in the sewage pipes, which can then overflow. The 2015 water and sewage appendix of the master plan states that "the existing collection line for the Shefa-'Amr sewage is small and is not sufficient to transfer the peak flows in the current situation, causing sewage overflows and accumulation of sewage in the Shefa-'Amr collection and main transmission lines". Note that due to inappropriate items being flushed down the toilet and the limited capacity of the sewage pipes, there are also blockages and overflows of the sewage pipes in the dry season.

#### 7. Partial availability of water pumps as flood response technology

The municipality contracts privately-owned pumping trucks if needed. According to the focus group interviews, individuals do not have private pumps.

As mentioned in 'Institutional capacity', it should be noted that at the national level there has been "a change of approach in the perception of the drainage issue – from a concept that treats water runoff as a nuisance that must be drained to drainage axes as fast as possible, to viewing it as a resource that can be utilized into parallel systems... [and that upstream] containment and retention facilities for runoff must be developed and in cases where it is possible to even percolate the runoff into the groundwater" (East neighborhood drainage appendix, section 5.1, see also Goulden et al 2018).<sup>103,122</sup> This relates in particular to points 2 and 5 above.





Figure 43 - Flood prevention and response municipal activities



## Public leisure space and infrastructure

Public leisure space such as parks, playgrounds, sports fields, and walking and cycling paths can contribute to physical and mental health and community building.

Shefa-'Amr has seen a significant increase in playgrounds and sports fields in the past couple of years, with 5 new playgrounds, 5 new football and mini-pitch sports fields, and the restoration and development of 'Ayn Afiye' as a small park financed via calls for proposal (see "financial capacity" section). Also relatively recent are a walking path in the corner of Somekh junction, and a 5 km mountain biking single trail in the eastern "Shefa-'Amr forest" (which meets the the international standards of the World Cycling Union, and hosts national competitions regularly).

As mentioned earlier, as part of the Ministry of Transport "Authorities of change" project, there are also road cycling/walking paths planned, mostly in the outer neighborhoods.

Despite this development, in focus groups participants often raised the issue of a lack of public leisure space, and often contrasting it with Jewish neighboring localities like Kiryat Ata (see quotes). If we look per neighborhoods, these are the neighborhoods without playgrounds nor sports fields:

	Inner neighbordoods	Outer neighborhoods (adjacent to fields/woods)
Neighborhoods with no playground nor sports field	El Hai el-Akhdar (el Fawar east), El Midan, El Ayn, Wadi El Saqia, Old City east (xxx)	Abu Thabet, Abu Shehab, Warat Jarous, Wadi Hausha, El Wastani, Suftadi, Abu Sheikh

Related issues mentioned in different sections of this report also include:

- Urban planning challenges including the lack of public space
- Appropriate spaces for different groups e.g. see boxes "Physical activity, climate and gender" and "Loneliness and social isolation in older adults" – and the needs of people with handicaps is also important
- Crime, vandalism and littering
- None of the sports fields (including outdoor gyms) are shaded
- Sports fields and playgrounds don't have water fountains
- Three playgrounds have virtually no natural/green elements





See also this online map of public spaces in Shefa-'Amr (with photos for each site)<sup>14</sup>

\$



#### Focus group participants – public leisure spaces

"Go to Kiryat Ata, if you want to go for a walk in our city we cannot, but they can. So, I go all the way to Kiryat Ata to do some sports, for half an hour- an hour, and then I go home. Why not in my city, while my city is a big city, why there isn't a road with enough space so we can do a little bit of walking?"

"There is nothing that can protect the elderly in outdoor activities because of this **acute lack of shaded places and no parks**, no benches to rest."

"There are many issues – no parking, no space, no hospital, no places to sit, no walking paths. There is a lot missing."

"Parks are in Kiryat Ata with trees and places to sit, and paths, the swimming pool. **These are the** minimum things that should be in every city."

"There's also a kind of forest "El Kharobia" [formally this is part of Kiryat Ata forest, outside of municipal borders but right next to south-west Shefa-'Amr] where people can go sit or walk but the problem is not every car can get through with the road there. It's a **nice place for the kids** to play but there is no suitable way to get there."

"In the Jewish localities they have all this. And an Arab one like Shefa-'Amr, even though it's big, we don't have anything for our hobbies, there are no pools, we have to go to Jewish cities just because we don't have pools or even parks, so that's so hard for us."

"We're not asking for too many things to make it harder on the municipality, just some benches, water fountain, these kind of things, green grass for people to sit on it, the basic stuff. We're not asking for the Bahai garden or something as in Haifa or Akko. We're not asking for a promenade or something... [other participant adds:] Plus, **the cars in the streets are the most dangerous**, if you want to walk you cannot, even where we're supposed to walk there are cars."

"I walk, behind my house there's an open area kind of a forest [between Al Midan and Ibillin]. It's not easy, for a woman in my age, it's all uphill and downhill. But **walking gives me serenity**, that's the only thing that gives me serenity. I live on my own, all my kids are married, so this hour that I go for a walk is the love I have in this life, it's the moment I get to breathe."

Quotes 9 - Public leisure spaces









Figure 46 - Sports fields accessibility





Figure 47 - Junctions density as a measure of walkability



## Walkability and junctions density

While sports require time and sometimes involves financial costs, walking to daily destinations ("active transportation") is a good way to get daily exercise. Walkability enables "active transportation" to destinations such as school, grocery store, post office, neighbors, bus stop, etc.

Walkability involves many variables: sidewalks availability and accessibility, safety, slope, shading, junctions density, destinations, etc. In hot weather, important features include shade, options for rest, water fountains, and short distances to destinations.

Why is junctions density relevant? "A good walking network allows the pedestrian a multitude of walking options and shortcuts in order to reach his destination. The greater the number of nodes, the more branched out the walking network, allowing for more walking routes", see more at <a href="https://citywalk.org.il/">https://citywalk.org.il/</a>.



Background information 12 - Walkability and junctions density

Sources: City Walk indicators123



# Physical activity, climate and gender – how do public spaces encourage girls and young women to be active?

Physical activity is important for everyone, and high temperatures and rain are barriers to outdoor physical activity for everyone as well. Nevertheless, it is worth noting elements related to gender:

- 1. In Israel overall as well as in Arab society, the rate of girls who perform enough physical activity according to public health recommendations is lower than boys. Therefore, it is worth encouraging physical activity in girls in particular.
- 2. In the "Exposure" section there is a recommendation to prioritize sports fields with synthetic grass for shading, because of their high temperature. At the same time, it is important to pay attention to the users of these sports fields. It is likely that they are mainly boys and (young) men.

There are currently 4 football teams for girls, 19 basketball teams for girls, the 'Shefa-'Amr Riders' cycling club includes many girls (including Munira Yassin, who is the Israeli youth champion in cross-country cycling - Calcalist and Haaretz 2022), as well as other groups (חגים) for boys and girls organized by the community center or by private gyms. Examples include ballet, boxing, and capoeira. It is also worth noting that the annual municipal financial support criteria from the sports department does include a 10% weight on "activity that encourages different sectors - women's sports, sports with disabilities".

At the same time, most of these groups still require a fee for participation, and people do not usually participate in groups several days per week. As such it is worth investing in public space enhancements to enable active daily living for girls, for example:

- Quality sidewalks to allow walking to school, running or leisurely walks
- Parks and public/school playgrounds that are suited to girls\*, at walking distance
- Public sports fields that encourage sports other than football/ enhancements on or around football fields that allow additional or alternative uses\*\*
- A local swimming pool\*\*\*

These are high-level, general possibilities - it is highly recommended to consult on this topic directly with girls and young women from the community.

# Note that similar points could be raised for other groups like older adults or people with disabilities.

\* Research shows that some common park/playground designs are used more by boys. See e.g. <u>https://makespaceforgirls.co.uk/</u>

\*\*E.g. for a few months the municipal sports department organized a walking group for older women on the soccer field located next to the community center.

\*\*\* For financial sustainability this would still require an entrance fee, however it is included as it was mentioned by participants as lacking and can be used in hot weather as well.

Intersectoral issues 9 - Physical activity, climate and gender

Sources: Calcalist 2022<sup>124</sup>, Haaretz 2022<sup>125</sup>, municipal support criteria<sup>126</sup>, Make Space for Girls<sup>127</sup>



## Drinking and irrigation water

Currently in Israel, more than 80% of domestic water is supplied via desalination, and 87% of wastewater is treated and reused primarily for agriculture - and only 35% of water for agriculture comes from freshwater sources.<sup>128</sup> Still, there are environmental and capacity concerns regarding desalination – including the fact that it requires significant amounts of electricity, 90% of which currently comes from fossil fuels and therefore contributes to greenhouse gas emissions.<sup>129</sup>

### Drinking water

- According to interviews, houses built without permits do have access to drinking water. It is relatively easy to build the house's water pipe in order to connect it with the main supply.
- The quality of the drinking water supply has been good based on 20 sample points throughout the city, and can be checked online: <u>https://mywater.health.gov.il/WaterNetwork/Search?cityId=8800&cityTitle=%D7%A9%</u> <u>D7%A4%D7%A8%D7%A2%D7%9D</u>

There was a drinking water quality issue in April 2023 that was widely communicated and resolved within a couple of days.

#### Irrigation water

As mentioned in the sensitivity section (economic sensivity in agriculture), currently in Shefa-'Amr the only water available for irrigation is high quality water that is suitable for drinking, and more expensive than treated sewage water.

Adding a treated sewage water pipe for agricultural fields in Shefa-'Amr would require investment from the Ministry of Agriculture, which seems unlikely considering low demand.

There are debates around irrigation water along the Tsipori stream for some lands that are outside of Shefa-'Amr's municipal territory, but owned and farmed by Shefa-'Amr residents. The authorities do not agree with farmers pumping water from Tsipori stream to irrigate their fields without paying for the water (but paying for the fuel to operate the pumps). Possible plans of using water meters did not work out, so currently there are plans to build an irrigation pipe to replace the pumping. Apart from the economic aspect, ecologically it is important to keep a minimum level of flow in the stream.

Regarding irrigation in the city - certain sustainable stormwater management practices could potentially reduce the need for irrigation in urban gardening to some extent, but these are not currently used (see "stormwater management"). See also the box "rainwater harvesting" regarding domestic, outdoor urban uses.

## **Human capital**

Human capital looks at the knowledge, perceptions and skills of the general public as well as the municipality. This includes general education as well as items more specific to climate change preparedness.


# Municipality human capital

A 2015 study found that "in most Arab local authorities there are no departments like 'economic development', 'economic society', 'improvement of the authority [shefa?]' or 'spokespersons'. In addition, most authorities reported a shortage of standard workers in all departments, including the engineering, welfare, education and sanitation departments".

In Shefa-'Amr however, there are roles for beautification (shefa), spokesperson (dovrut), and in terms of economic development there is the resource development officer (ממצה משאבים) and the cadet אוער השלטון המקומי who is focused on strategically developing the local economy via employment and local businesses. There are also full-time roles for the health promotion coordinator and the advancement of women, and, for the coming 4 years at least, for the promotion of 'optimal aging'.

External financing supports some of these human resources: the two 'local government cadets' ממצה משאבים, as well as the project-related roles for Muni100 and a part-time role supporting the preparedness to climate change project.

However, several reports and interview did point towards a lack of staff, for example in the municipal comptroller/auditor's office, in the environmental inspection department, in the tax collection office, and also the number of sanitation employees (street cleaners). Apart from the municipality, the state auditor 2016 report also highlighted that the regional planning committee significantly delayed the hiring of required a legal advisor and a prosecutor, which probably produced a gap in legal expertise and services for about a year.

There is no sustainability department, urban planner, landscape architect nor hydrological engineer – all particularly relevant to climate change preparedness.

It is common for the municipality to outsource certain kinds of work to consultants. This is probably more costly, but also prevents the development of further professional knowledge within the municipality. Furthermore, when the consultancy is related to planning, it may also lower the potential for implementation once the consultant produces the plan. One example related to climate change (although more on the mitigation side) is the CLIMA-MED plan, which was indeed produced by outside consultants and which has mostly not been implemented.

# General education and employment indicators

Indicator	2008	1995	1983	1972	Updates if available
% academic degree	10.9	4.0	2.8	0.2	11.7% (2020 – only for
					degrees obtained in
					Israel for people ages
					35-55)
% men employed in	28.4	35.7	35.6		גברים המועסקים בכוח %
annual civilian labor					העבודה האזרחי השנתי
force					
% women employed in	11.1	9.8	8.7		נשים המועסקות בכוח %
annual civilian labor					העבודה האזרחי השנתי
force					

Table 24 - Education and employment



# Awareness and understanding of climate change

There is a high awareness of climate change as a general concept in the community and in the municipality, and people think it is something serious. There does not seem to be a significant climate denial phenomenon. In both the survey and the focus groups, the overwhelming majority show that they think climate change is happening and that it is the result of human activities.

According to the survey:

- 96.9% responded that they think climate change is happening
- 36.1% answered that they think climate change is caused by human activities, and 58.5% by human activities and natural changes
- 42.9% answered that climate change has already started to harm people in the Galilee and 45.9% think that climate change will begin to harm within 10-25 years





Which of the following impacts of climate change do you think may impact Shefa-'Amr during the next 20 years?

At the same time, there is a lack of deeper understanding of the phenomenon of climate change and its effects - including local effects.

In focus groups:

• Participants asked for explanations to understand the phenomenon better



 Some participants linked climate change to the hole in the ozone layer (for example one explained that it is warmer today because of the hole in the ozone layer), which is not accurate.<sup>vii</sup>

## Focus group participants

"Globally the weather has changed, in the whole world, I think there are reasons, we need to investigate the reasons and handle them. ... Maybe it's because of these factories ... The ozone layer and the expansion of the atmosphere, all this increases the climate change, it's global."

"With help, and decrease the ozone layer [the climate] will go back to the way it was before"

Quotes 11- Some think the hole in the ozone layer is a key climate change factor

According to the survey, 42.8% correctly answered 6 out of 6 knowledge questions about climate change:

- 84.6% correctly answered a question about the greenhouse effect
- 49.4% correctly identified 5 out of 5 global consequences of climate change. The global consequences which were less recognized were as follows:
  - That weather does not follow historical patterns and is more difficult to predict, identified by 73.2%
  - The possibility of the spread of vector diseases (e.g. West Nile fever) to new areas, identified by 70.9% of respondents

<sup>&</sup>lt;sup>vii</sup> Explanation: There is a connection between the hole in the ozone layer and the climate, but the hole is not a significant cause of climate change at the global level. The threat from the hole in the ozone layer is the resulting increase in UV radiation, not global warming. In addition, the hole has significantly shrunk after the cessation of the use of CFCs following international agreements. Thanks to this, the situation is under control and is no longer considered a significant threat. In contrast, climate change is considered a significant threat which is not under control as there hasn't been enough progress in reducing greenhouse gas emissions.





#### Knowledge variable K6 (new) - combined 6 questions (K1 and K5)

Number of knowledge questions answered correctly

## Q4 2 - Surface temperatures are setting new heat records about each year Q4\_4 - More extreme weather like droughts, heat waves, and hurricanes Q4\_1 - The polar ice caps are melting, and global sea levels are rising Q3\_What is the greenhouse effect? Q4\_3 - Weather that does not always follow historical seasonal patterns and is difficult to predict Q4 5 - Insects that are vectors for diseases such as dengue and West Nile Virus may spread to different areas 0 20 40 60 80 100 %

#### % who answered knowledge questions correctly, per question

The participants in the focus groups related climate change to other environmental challenges – this suggests that they perceive climate change as part of environmental challenges. Examples of environmental challenges mentioned:

- Waste (a theme that repeated itself in many groups)
- Pollution from plastic, recycling
- Preservation of trees
- Hazardous industrial materials
- Preservation and enrichment of the soil

It is true that climate change is an environmental issue. However, viewing it only as an environmental issue may prevent wider interest in the issue, whereas climate change risks



include health and economic risks as well. In order to emphasize this, it may be useful not only to talk about 'climate change risks' but to also specifically talk about specific risks such as 'risk of high temperatures' or 'of floods', etc.

Similarly, both focus group participants as well as the municipality raised issues related to the reduction of greenhouse gases, such as reducing electricity use or the use of solar panels, but were not familiar with the concept of adaptation or preparedness.

# Concerns about climate change

According to the survey, people are worried about climate change, and when comparing extreme heat and floods, they are more worried about extreme heat.

Seven questions asked about the respondents' level of concern about different hazards in general. The goal was not only to assess the level of concern about climate change, but also to place it among other current issues that are known sources of concern.

The hazard that respondents indicated as most worrying is crime and violence (79.2% of respondents are "very worried"). This is a logical result in the context of the issue of crime and violence in Arab society.

Extreme heat was the second hazard in order of level of worry (45.2% "very worried"). Perhaps there is a greater worry about extreme heat compared to floods because all neighborhoods are exposed to heat to a similar extent, whereas some neighborhoods are not really exposed to floods. Communicable diseases were the least worrisome issue in the "very concerned" category.



Notes on survey context that could have influenced the results:

 According to the number and rate of murders between 2018 and 2020, Shefa-'Amr is not one of the settlements with the highest rate of violence – but there were still 6 murders in these years.<sup>130</sup> After the survey, there was one murder in 2022 and several shooting incidents.



- Several extreme climate events in the summer of 2021 were quite visible in the news: heat waves in the northwestern United States and in the Middle East and Central Asia in July and August; floods in Germany, Belgium and China in July; and the fire in the Jerusalem mountains in August.
- In May 2021 there were a series of violent events in the country including riots and police violence, and attacks between Gaza and Israel.
- The period from August to October 2021 was within the fourth wave of the Corona virus in Israel (related to the delta mutation). More than half of the population in Israel was vaccinated. There was no lockdown, but at the beginning of August guidelines such as the 'green pass', use of masks and 50% work from home were reactivated. At the same time it was also the period of the booster (third vaccination).<sup>131</sup>

In focus groups we did not ask directly if people were worried. However when we mentioned that in the future there could be up to two additional more months of hot days (over 33 degrees), the reactions of the participants in several groups suggested that it would significantly affect the community: "It will be more difficult than Corona", "catastrophe".

# Attitudes regarding preparedness and readiness to take adaptation measures

In the survey, close to 50% of respondents indicated that the municipality had "high responsibility" to act regarding climate change and its impacts, and 3X% indicated that the municipality has "moderate responsibility".

These responses are high, but relatively lower than the perceived responsibility of international organizations, companies/industry and governmental institutions. This might be related to an understanding of climate change more as a global phenomenon and less as a local one, and an understanding of action as mitigation actions rather than adaptation, as mentioned earlier.

This interpretation is supported by the fact that neither international organizations nor the industry were mentioned when we asked participants what should be done to better prepare Shefa-'Amr for climate change (however, the industry was mentioned related to pollution). Once people understood the idea of adaptation, focus was on the municipality, as well as the government and municipalities.

According to the survey, there is a high willingness to act for preparedness actions like to sign a petition, learn more about climate change, plant trees, and adapt buildings to heat and to have appropriate drainage (83.8 – 89.8% willingness). On the other hand, there was less willingness to consider climate change and its impacts during elections, which signals other political priorities (65.6%). Lastly, there was low willingness regarding the controversial suggestion of selling or exchanging land in order to enable more green public spaces (33% willingness). This is of course a sensitive and complex topic that may be better analyzed with focus groups rather than just one survey question. Khamaisi 2018 does report: "The interviews, meetings and polls carried out in the course of preparing master and detailed plans show that private owners are ready to allocate 40% of their land for public purposes, on the proviso that it is done equitably, using balance tables for land improvements" (note that this is not the same question as in the survey as it refers to allocating part of the land, rather than selling or exchanging plots).



Figure 48 - Willingness to take adaptive actions

In focus groups, there were mixed positions regarding the need and willingness to take preparedness actions. Participants proposed many concrete private and/or public measures, including trees; parks; sidewalks with benches; water fountains; a swimming pool; shade for sports fields; electricity subsidies or lower prices; general increase in income; fans; more community centers and social clubs; shopping malls; shade facilities for private houses; heat-resistant design for private houses e.g. insulation, orientation, etc.; more bus stops; more space/less density; prioritizing Shefa-'Amr residents when there are residential building opportunities; better drainage/larger drainage pipes; domestic rainwater harvesting; awareness raising; encouraging greenery and cleanliness via a social competition; trying to use less A/C to develop more personal tolerance towards heat; adapting work hours for outdoor workers and providing them with protective gear; for farmers reduction in land arnona.

At the same time, some participants said that one should accept the situation: "This is life and we have to accept it. Heat and rain. We have to live with it and it will pass peacefully." "There is nothing to do, there is no choice." Similarly, some participants asked what the municipality can do anyway, because it cannot control the weather: "I want to ask, can the municipality control the heat or the factors of the weather?" "It's not in our control, it's in God's control." Our interpretation is that perhaps these attitudes are related to faith, or to experience coping with difficult situations. However, it also suggests that people are not aware that there are options for better adaptation and preparedness. It is true that the weather cannot be controlled at the local level, but infrastructure and conditions can be adjusted to reduce risks and hardship.



"Maybe the solution is that the municipality plant trees like in Akko and like in Kiryat Ata, when you go there it's also hot but at least you have a place to walk under the shade"

"More community centers, more clubs so people will have more places with A/C and not to have to be in the streets"

"Shade. Not enough shade in houses, in the neighborhoods, at the seaside. Trees also help to absorb pollution, and make nice smells, gives a nice atmosphere to the neighborhood. People don't know how important this is. The municipality leaders don't know how important it is either."

"This should be part of the social security, payments for disabled children, because there are many children who find it hard to be in a hot environment, and they need air conditioning"

"Without AC we can't handle it. The whole time the A/C is on and it impacts on finances, for example we had to pay 2000 NIS electricity this month, it's a big house and there are kids. It means that they have to raise the employee's salary in order for them to be able to handle the expenses."

"We will have a problem regarding water need. People have to pay a lot. There will be an economic problem"

"[a group had already started thinking about an initiative to enhance public space:] Let's do challenges about who has the nicest neighborhood, who plants the most gardens, on Facebook, on social media, we are building a plan"

"Work hours, this really helps. Start earlier and less hours. And the productivity won't be hurt. Also giving outdoor workers good conditions, for example contractors can arrange for a small shade, and every two hours have a break.. instead of one break per day, it will be more."

"First of all a tree, or two trees. And the type of building. .. for example isolation in walls, in roofs. For the balcony to be like this. Many people [currently] put a big window in the living room, maybe [instead] to make it smaller. Think about the orientation of the house, western or eastern."

"If there was more space they could plant more trees, do the right infrastructure, then maybe we could deal with the weather, whether it's hot or cold. Density is an issue."

Quotes 12 - Community ideas for preparedness

# **Social capital**

## Social resilience

Social resilience is considered an important factor in responding to emergency situations as well as in preparedness and coping with complex longer-term community challenges.

This is a complex concept to measure and assess, and our different research methods presented mixed results.

## Survey

In the survey we asked 5 questions related to community resilience, focused on mutual assistance and emergency events. The combination of the questions produces a scale score of social resilience from 1 (low) to 3 (high). The result does not show high social resilience for Shefa-'Amr overall:  $1.64 \pm 0.49$ .



The only neighborhood that had a social resilience score above 2 was the neighborhood of Abu Shehaab. The two areas with the lowest social resilience scores were north-eastern area (El Fawar, Suftadi) and Zahr El Kanis.



Figure 49 - Social resilience score, residents survey 2021 (438 respondents)

Social resilience - to what extent to you agree with the following statements





Figure 50 - Social resilience answers, residents survey 2021 (482 respondents)

## Focus groups

# Volunteers, social groups and social engagement

Several of the focus groups were attended by people who volunteer or are socially engaged in various groups. These participants said that it is important for them to volunteer and contribute to their community and environment. Volunteer groups mentioned activities such as cleaning a public open space, giving lectures to children at school, an initiative to prevent food waste, submitting a plan to make the city more women-friendly, advocating for a local park, etc. Social groups mentioned activities such as regular meetings and a swimming course. Participants seemed to express very positive feelings with regards to such groups.

Related to this, one participant highlighted that while budget constraints are always discussed, there is a lot of power in social engagement in Shefa-'Amr. As an example he mentioned how in 2021 XXX NIS was raised for Syrian refugees.

Types	Civil society organizations, social groups		
Youth	Muslim, Baladi, Christian and Druze scouts		
	Youth club Mahed elFady		
	<u>Ofakim I-atid</u>		
Older adults	Different organized groups, for example: retired teachers group, 'Morning Coffee' group, the Mother Theresa women's group, older volunteers related to the program 'Baim I-tov', women's group 55+ related to the Histadrut, the older citizens council of MUNI100 project		

 Table 25 - Civil society organizations and social groups in Shefa-'Amr (not necessarily comprehensive)



Community and volunteering	Groups of volunteers related to the Community Center: main volunteers group, Beterem safety ambassadors, group of cleaning trustees <u>Nma association</u>
	Women of the castle
Charity and	<u>Taybe association طيبة</u>
numanitarian aid	Shaghaf association شغف
Sports	<u>Sportage club نادي سبورتاج</u> (basketball)
	ShefaAmr Riders (cycling)
	Hapoel club (football)
	F.C. Shefara'm (football)
	Union Sons of Shefa-'Amr (foodball)
Personal	الحضن الدافئ Warm hug association
development	
Culture and religion	<u>eyt alMusiqa بيت الموسيق</u>
	جمعية ومركز جني الخير Jana alKheir association and center
	Sabeel el Majd

# Social infrastructure: community center, senior centers, Eshkol Pais,

The participants spoke positively about the community center, the senior centers, the scout movement, the Otzma center, and Eshkol HaPais. Some of them participate as volunteers with the community center, and they also said that they appreciate opportunities for free courses from these institutions (although others highlighted that many activities at the community center do require payment and this may exclude part of the population).

# Mistrust in the municipality and shared responsibility of residents

The participants spoke in a mixed way about the work of the municipality. They expressed a lot of frustration about the city's infrastructure and the related role of the municipality. For example, there were complaints related to waste collection and cleaning, or the lack of progress in programs (for example, a pool, a walking path, a plan for a city more suitable for women). The participants said they pay property tax but do not receive the services. There was also an expression of distrust in the municipality - for example, some participants talked about corruption, and lack of professional capabilities.

At the same time, some participants also stated that there is also responsibility regarding challenges on the part of the residents, and/or that they are aware of municipal challenges such as lack of budget or resources (including that there is less income from an industrial area with many garages and a new resources that the high-tech industry, and that there is no income from the Hanton quarry). They said that the people should also take responsibility for their neighborhood and city, and some mentioned issues of vandalism.



## Focus group participants - mistrust and responsibility

"The problem is that we, our children, our grandchildren, come and break everything that the municipality puts. [other replies:] Children break things, And if you speak with them, they laugh at you. I started talking and explaining that it's not allowed to behave like like this. And they don't like it. [other replies:] They start saying 'who are you, why are you speaking to us'"

"There is vandalism, it's true, but then there is no one who fixes the damage."

"You notice that there is a specific behavior by people, the leaders, and the municipality. We are fighting fires, we are not taking care of each topic to the end, until it's done and we see results. We always start something, leave it and start something else."

"Planning, they are always planning. [other replies:] They have been planning a swimming pool for 30 years."

"If there is no administrative corruption, none of these problems would exist. The money just disappears once it gets to the municipality."

"I try to say that we are part of the responsibility, not only to point one finger at you but three fingers to myself. So there are many good things in Shefa-'Amr. There is also a lot of corruption in Shefa-'Amr. In the institutions. It's known, we all know it. ... The women are those who do, who volunteer without money."

"To bring into the city of Shefa-'Amr someone who understands sanitation (תברוא). Not a family member of the mayor, not a cousin, no no. We see that everything is deteriorating מדרדר because there are no professionals in the municipality, there are no tenders."

"We forget that we are the municipality – we elected them. But we elect according to who are our family, friends, religion."

Quotes 13 - Mistrust in the municipality, together with call for taking responsibility

## Brotherhood, mutual help, religious co-existence

When we asked the participants what they like/are most proud of in Shafaram, a common answer was that there is a combination of religions and peace among them. Participants also said that people support each other and care about others.



Focus group participants – community gaps

"In the past we were more unified between neighbors, children would visit different neighbors, not today. The world today is not as it was. Everyone has work and earning money. Everyone is thinking about themselves". – Focus group participant

"To say the truth is hard and it hurts. We say that there is [inter-faith] collaboration and everything is nice.. I don't agree. Because if I look in depth, there is no collaboration. To the outside, we show a lot of collaboration, in words, but in actions, no. Unfortunately. ... If there is something that is hurting the whole city, yes, there are many people from all the faiths who want to help. If there is an initiative, then everyone will participate [for example if someone is raising money for an expensive surgery]. But if I compare the past to the present, at funerals in the past, we would see elderly and younger people participating in funerals. Today, there are almost no younger people at funerals, and if the person who passed away is Muslim, I don't see Christians or Druze that come to the funeral. I [only] see people who know him. ... I'm worried because it's going in this direction, with the young people. Also for weddings, same thing. ... Today many things changed, life changed." – Focus group participant

"People feel like 'I belong to the religious community before I belong to the city.' The people who believe otherwise are very few." – Focus group participant

Quotes 14 - Gap between religious groups

## Family and neighborhood ties

An example of intergenerational support: an elderly woman said that you can't control the weather that comes from God, but that you can help each other a little, for example support women who work. She takes care of her grandchildren.

An example of limitations in intergenerational support: When we asked the elderly (widows) if they would use public transport more if it were more available, they said yes. One said: "We prefer the bus, we live alone, everyone is busy, we can't (always) trust our children who are married and have their own lives"

The elderly widows said that there are fewer visits, and that this is related to their change in life: women work more, everyone is busy to make a living and meet the cost of living, and also the effect of the corona virus. For example, one widow said that her sister helps her, and recently her sister is busy with her work, so her niece visits her once a week to help her.

Relatedly, a participant in another group said that her mother liked to sit outside to see who was passing by. "Inside the house, you are lonely"

Regarding neighborhood ties, a participant said that there was more unity between neighborhoods in the past, and that children walked between neighbors, which they don't do today. "Everyone has a job and earns a living, everyone thinks about themselves." A world of shekels and the Internet



Natural/environmental capacity To add

Conclusion

<mark>To add</mark>



# Appendices



123



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125



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