Contemporary Rural Dwellings in Jordan:
Conception, Construction, Habitation The

Case Study of Umm al-Yanabi' Town

2020

Center for the Study of the Built Environment (CSBE)

in association with **Uraiqat Architects**

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This study was facilitated by Habitat for Humanity Jordan; an international NGO that has supported more than eight thousand families in Jordan through shelter rehabilitation since 2002. Its loaning program, Fund for Humanity Jordan, was launched in 2011 and has facilitated wholesale loans issued to Community Based Organizations, or CBOs, that are committed to start and grow their own sustainable housing program to serve low-income families.

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Introduction

A specific typology has come to dominate the making of rural dwellings in Jordan over the last generation or so. This is evident in their planning, massing, and in the construction materials and methods used for their making. Although this is apparent, there in fact is very little available data documenting such structures. This initial study examines the making and building of these dwellings in order to begin to shed light on them and provide a point of departure for analysing such structures and further developing them to be more effectively aligned with the needs and resources of their users.

This study addresses the following sets of questions:

- How are these dwellings planned? To what extent is the planning carried out by the inhabitants themselves, by the contractor, by an engineer (usually a civil engineer), or by an architect?
- What are the average areas and typical layouts of these dwellings, and what are the average numbers of people (and the relationships between them) inhabiting them?
- What are the costs of constructing these dwellings (land, foundations, structure, electro-mechanical, finishes, etc)?
- What licensing procedures are officially and practically required for them? Also, if such licensing procedures are required, do they serve to guarantee minimal standards in terms of planning efficiency, structural integrity, and the functioning and safety of mechanical and electrical systems?
- What are the construction techniques and materials used in the making of these structures? This applies to foundations; structural systems; wall, floor, and roof systems; openings (doors and windows), etc.
- If any, what levels of energy efficiency as well as thermal and water insulation are incorporated into these dwellings?
- How are infrastructure services (water, sewage, electricity) provided for these dwellings?
- What levels of maintenance and upkeep are provided for these dwellings, and what are the costs of such maintenance and upkeep?
- What responsibilities and decision-making authority do different family members in a given household (based on gender and age) have in terms of conceiving and realizing those dwellings, and also in providing them with maintenance and upkeep?

An Introduction to Umm al-Yanabi'

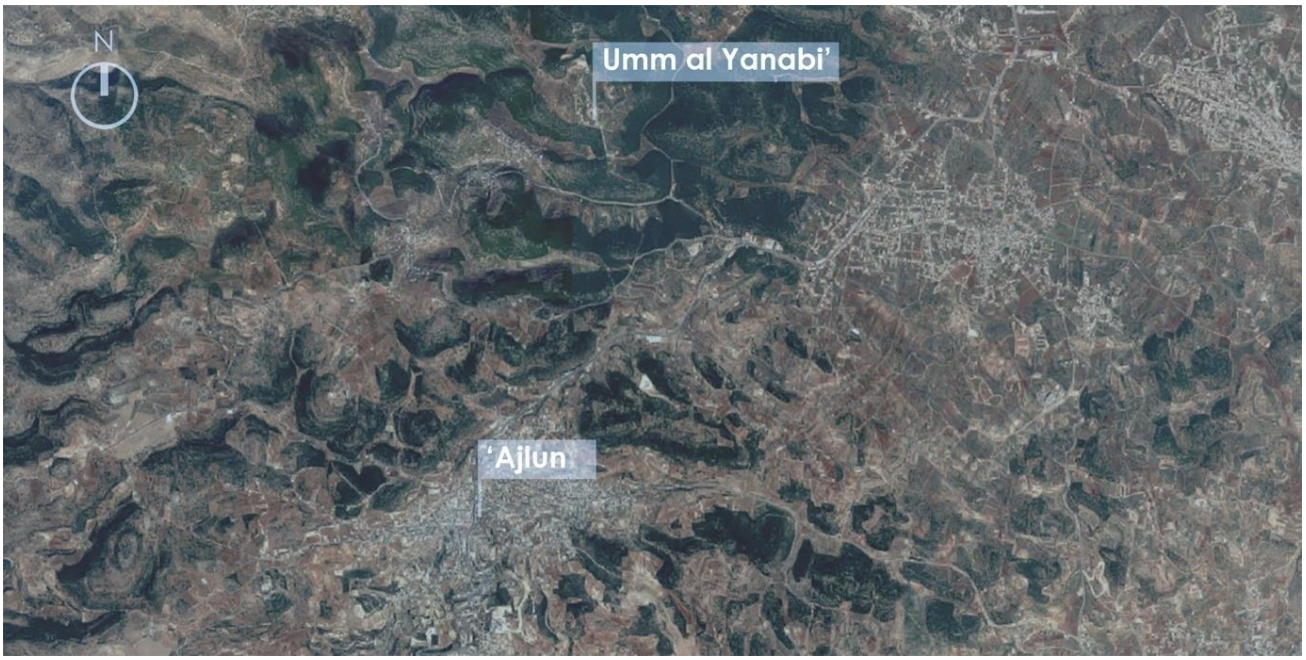
Located at the northern outskirts of 'Ajlun in the north of Jordan, Umm al-Yanabi' lies on one of the hills encompassing the 'Ajlun Natural Reserve. The small town of around one thousand inhabitants sits on the remains of a Byzantine settlement; cross-vaults as well as old walls and water wells can still be seen around the older part of the village.

Umm al-Yanabi's location in the 'Ajlun Natural Reserve and its close proximity to attractions such as the 'Ajlun Natural Reserve Visitor Centre and the Soap House have made the village a touristic hub, putting it on the map as a drop-off point for those visiting these attractions.

Aerial view of Umm al-Yanibi' showing built areas in white.

The aerial view above shows how the village of Umm al-Yanabi' spreads out from a relatively dense core without having clearly-marked boundaries. There are around seventy houses located in the village, a number of which are clustered next to each other and share walls. Other dwellings are more spread out. The distribution of houses in the village is partly the result of land distribution over the years though inheritances.

The village has an approximate built-up area of 11,200 square meters spread over 2 square kilometres, which translates into an average of 157 square meters per residence.



An aerial showing the location of Umm al-Yanabi' in relation to 'Ajlun.

An aerial view showing the location of Umm al-Yanabi' in relation to the 'Ajlun Natural Reserve and the Soap House.

The Yanabi' Woman's Association and Habitat for Humanity Jordan housing project

Established in 2004 by a group of women from the Umm al-Yanabi' in the 'Ajlun region in northern Jordan, the Yanabi' Women's Association (YWA) aims at empowering women and spreading awareness on a variety of issues among local communities in the area. The association has worked on variety of topics that have included developing energy-efficient buildings with the Jordan Green Building Council; conducting workshops on the importance of water and temperature proofing; offering loans for the purchase of solar heaters, energy-saving appliances, and rain-water harvesting systems; installing graywater treatment systems; and constructing two pilot model energy-efficient houses. The association also has addressed issues such as organic farming with the Royal Society for the Conservation of Nature (RSCN) and the Jordan River Foundation.

In 2013, YWA partnered with Habitat for Humanity Jordan (referred to from now on as Habitat Jordan; https://www.habitat.org/) on a housing loan program that offers families from the local community loans to build, expand, or rehabilitate their dwellings. The program is outsourced by Habitat Jordan to the association, which developed with Habitat Jordan a selection criterion for the families. Any family that wishes to obtain support to build a house would fill out a form for a loan. The association accordingly would visit the family's current dwelling and assess its financial means as well as its needs for a house / extension. Upon receiving an initial approval for a loan, both parties would sign a promissory note for the amount of the loan. The loan amount provided by the project for the construction of a new dwelling can reach a maximum of 6,000 Jordanian Dinar (JD), which covers part of the cost of building the house (more on costs is provided below). The amount is repaid over a period of 82 months, with the monthly payment amounting to about 75 JD.

The homeowner is then responsible for acquiring a site plan of the plot on which the dwelling is to be constructed from the local municipality, the needed construction drawings from a certified architecture / engineering office, and any other required permissions from the local municipality. Currently, there is one engineering office in the area providing working drawings to homeowners. These drawings are generally variations of the same house layout and are usually superimposed on the given site. It is worth noting that these drawings remain "ink on paper" and are not fully translated into built structures. This is because the homeowners modify building plans as they see fit, and only need to ensure that they adhere to the required zoning site setbacks. The homeowner is also required to supply all needed building materials. YWA for its part hires a builder with his team and oversees the whole construction process until the delivery of a finished dwelling.

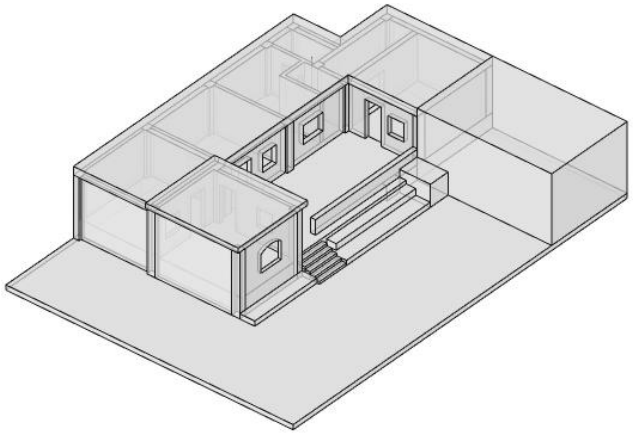
It is the presence of YWA and Habitat Jordan in Umm al-Yanabi' and their constructive relation in developing housing solutions for the town that encouraged us to select this site for our case study. The two institutions have been very open to cooperating with us, and Habitat Jordan hopes that the outcomes of this study will be of help to it as it proceeds with further developing various financial, administrative, and technical criteria for supporting the construction of homes in rural and semi-rural areas in Jordan.

Habitat Jordan and YWA have kindly provided us with a good amount of needed information for the study as well as access to the families benefitting from the project and the municipal authorities responsible for regulating construction in the area. We accordingly have examined the following six houses in depth, and have provided mapping for an additional fourteen houses, a number of which were built through support from the Habitat Jordan / YWA project.

The homeowners and their homes:

House 1: 'Uqlah

Area of house: 100 square meters
Area of demolished rooms: 25 square meters
Number of rooms: 3, in addition to a kitchen and a bathroom
Number of inhabitants: 6
Year(s) built: 1950s – 2018



House 1, isometric view.

Running costs: Unavailable

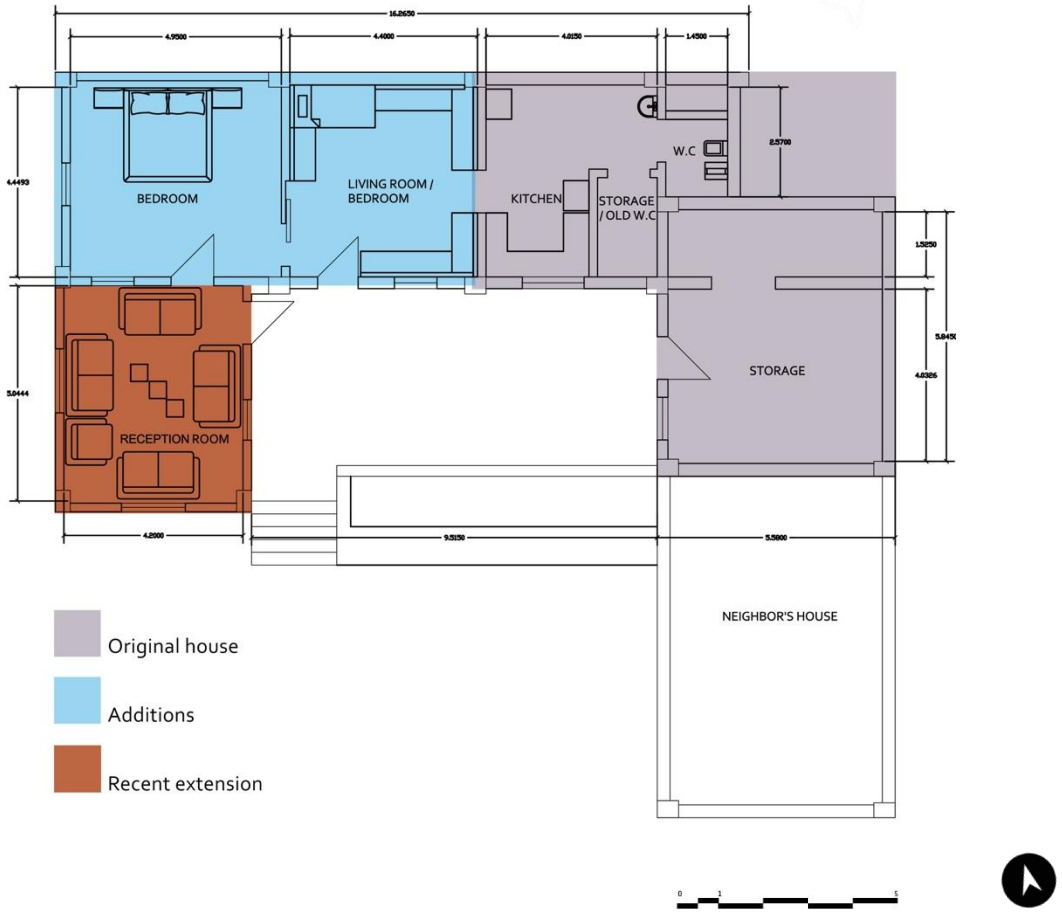
This family consists of the grandmother (wife of the late 'Uqlah), her newly-wed daughter and her two children (from a previous marriage), the daughter's new husband, and a younger daughter, who is based in Syria but visits often.

The grandmother moved into this pre-existing house when she got married, living in one of its three rooms with her husband, with the other two rooms occupied by her in-laws and her husband's uncle. This original house with its three rooms dates back to around 1950 and was built on a one-dunum (1,000 square meters) plot of land. As her family grew, and after her in-laws passed away, she added two new rooms (a bedroom and a living / sleeping space) to the pre-existing house, renovated one of the three rooms to include a kitchen and a bathroom, and used the two remaining rooms for storage, one of which was later demolished to build a small bathroom. The house also includes a small front porch, a back garden where the family grows herbs and green vegetables, and an ancient water well.

Today, the two remaining rooms are in bad condition, and are structurally unstable, with multiple cracks showing along the ceiling and columns.

During the past year, the grandmother applied for a housing loan through YWA / Habitat Jordan to add a 20-square-meter one-room extension to the house.

The new room was constructed over a four-month period and was completed in the winter of 2018 / 2019. It is now used as a reception room (also referred to in Arabic as a "guest room") / sleeping space. The total construction costs amounted to 1,200 – 1,400 JD. Construction materials were supplied from the nearby town of 'Arbin. The construction of this room was carried out by the eldest daughter's husband, Abu Mahmud, who works as a local builder in the town, and is hired exclusively by YWA and Habitat Jordan to build houses and house extensions, as well as carry out renovation work through their loan program (more about his work is provided below).



House 1, floor-plan layout.

The eldest daughter also applied for a loan to build a two-meter-high cinderblock fence around the site of the house, with a total construction cost of 3,000 JD. The family in addition recently installed a solar heater through a loan offered by YWA.

The family is facing problems regarding damp walls and water leakage at the bottom of the walls in the newly constructed room.

When asked, the family indicated that its current priorities for the house are to renovate the old remaining rooms into a second bathroom and a bedroom.

The family uses the neighbors' stairs to access their own roof.

House 1, front view.

House 1, view of one of the old rooms, which is currently used as a storage space.

House 1, view of the garden.

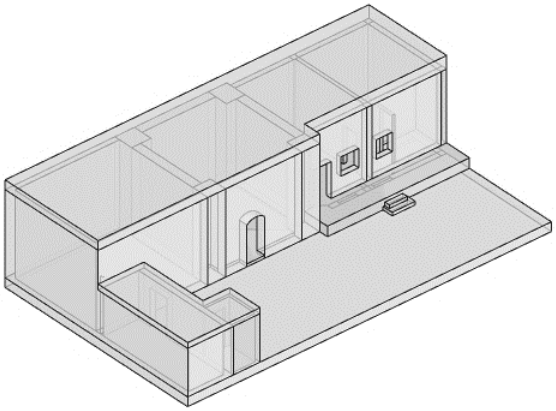
House 1, view of the recently-added reception room, with damage from water leakage already showing in the walls.

House 1, view of the street elevation showing the neighbor's house

House 1, view of the neighbor's staircase that is used to access the roof.

House 2: Evan

Area of house: 75 square meters
Number of rooms: 2, in addition to a kitchen and a bathroom
Number of inhabitants: 2
Year(s) built: 1930s and 1996



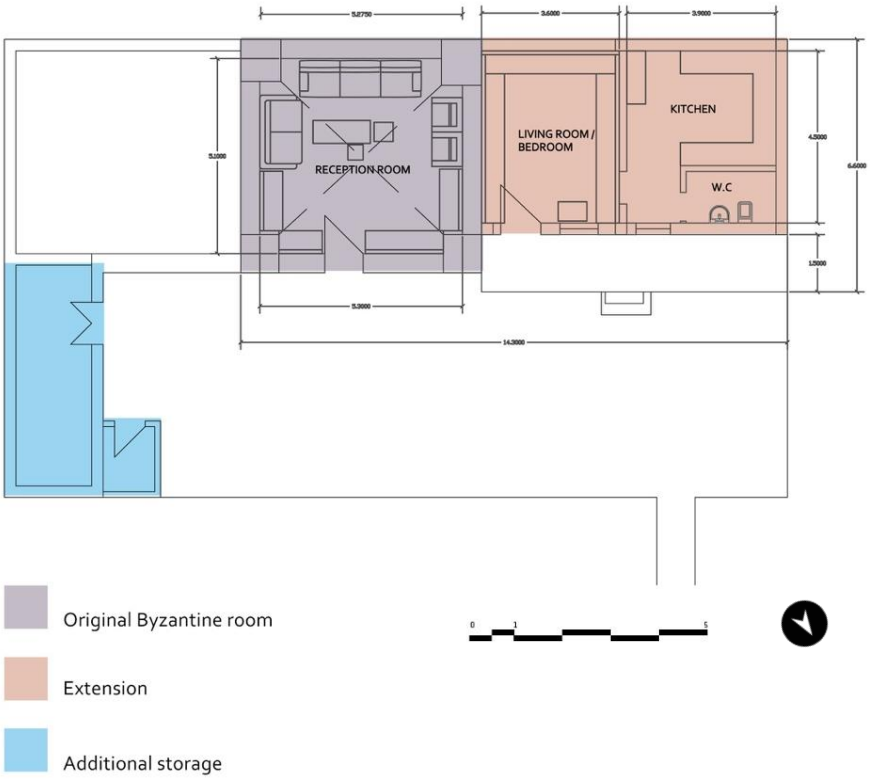
House 2, Isometric view.

Running costs in summer and winter, per month:
Electricity: 15 - 20 JD in the summer, and 10 JD in the winter
Water: 10 JD in the summer, and 10 JD in the winter
Heat source: Olive husk: 45 JD / ton; and firewood 55 JD / ton (consumption of 1.5 tons per season).

In the early 1930s, Evan's grandfather moved into this house of which the origins date back to Byzantine times. The house, which is primarily built of limestone, consists of two vaulted rooms, each of which is a perfect square.

Evan was born and raised along with her four siblings in the same vaulted room. One of the rooms was negatively affected by nearby excavations and weather conditions, and is nearly demolished, and only parts of it remain. In 1996, her father commissioned the construction of a third "modern" 40-square-meter addition, with a post-and-beam structural system, to accommodate a living / sleeping space, a kitchen, and a bathroom. The work on this extension was carried over a period three to four years. Two other small rooms were built on the site over time but are currently abandoned.

With time, her parents died, and all her brothers got married and moved into their houses nearby. Evan continues to live in the house with her sister. The remaining vaulted room is now used as a reception room, and the adjacent modern extension, built in the beginning of 1996, hosts a living space, kitchen, and a bathroom. The house has its own front porch, which is used for multiple functions and leisure activities.



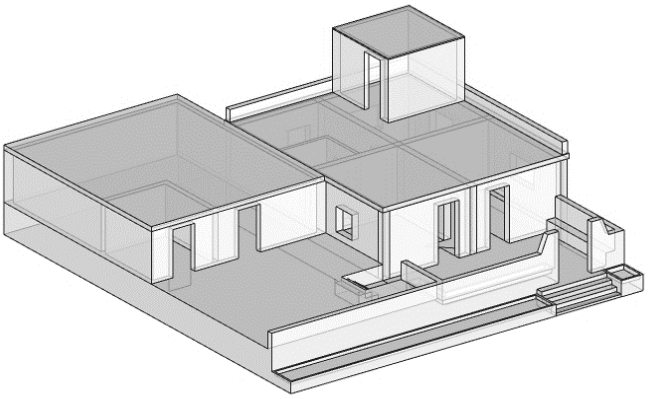
House 2: Floor-plan layout.

House 2, front view.

House 2, view of the remaining vaulted room.

House 3: Abu Hilal

Area of house: 80 square meters
Number of rooms: 3, in addition to a kitchen and a bathroom
Number of inhabitants: 8
Year(s) built: 2004 – 2007



House 3, Isometric view.

Running costs in the summer and winter, per month
Electricity: 16 - 20 JD in the summer, and 35 - 40 JD in the winter
Water: 16 - 20 JD in the summer, and 10 JD in the winter
Heat source: Gas cylinders (15 JD per week)

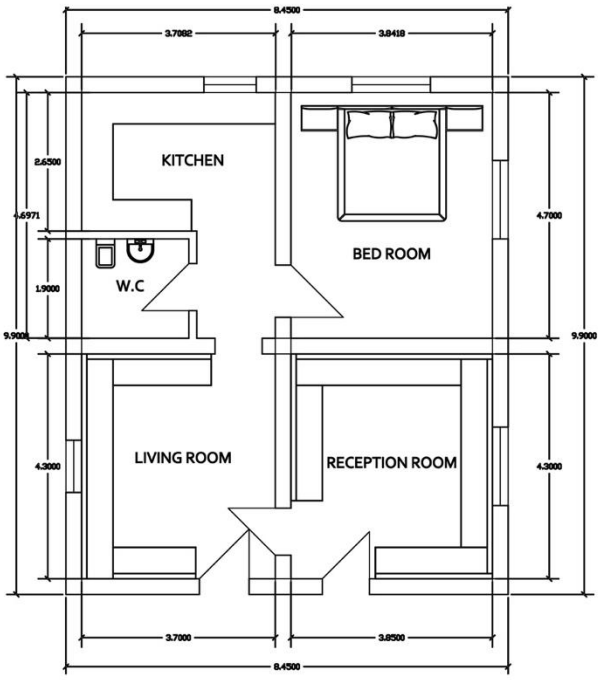
Abu Hilal inherited a two-dunum plot of land with an estimated value of 18,000 – 20,000 JD /dunum from his father in 2004. In the same year, he started building an 80-square-meter house, which was completed over a period of six months. Because of cost constraints, he only built one room, in addition to a kitchen and a bathroom. The completion of the two other rooms was carried over a period of two years. This rather long construction period resulted in Abu Hilal engaging different builders and suppliers on a pay-per-task basis. The final structure cost 15,000 JD, which was 1,500 JD over his original budget.

The final house consists of a bedroom, a living / sleeping space, a reception room, as well as a kitchen and a bathroom. Abu Hilal stated that the front elevation is clad with stone to "consciously mimic a traditional farmhouse." The house has a wide front porch, where the family grows herbs and vegetables, and a large backyard, where the family cares for cows and poultry. The family consists of two parents and six children.

Abu Hilal was very involved in the conception and design phases of the house, making all major decisions in terms of number and size of rooms, orientation, façade design, as well as garden and yard design. The builders were hired based on personal connections and on their reputation.

The family recently installed a solar heater through a loan from YWA.

The house faces problems regarding damp walls and water leakage. The family's main priorities now are to add one or two bedrooms, and to renovate the kitchen so that it would include cabinets and worktops, and to possibly make it bigger.



House 3, floor-plan layout.

House 3, view of the front porch.

House 3, back view.

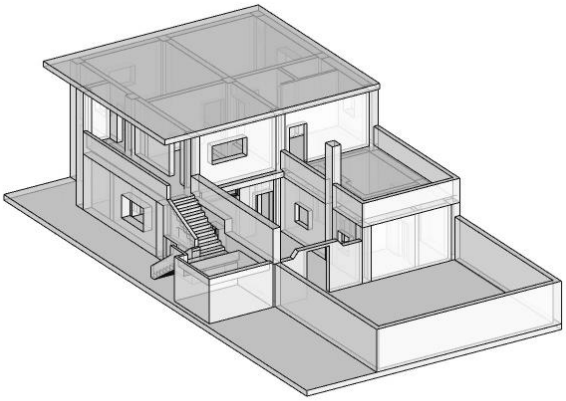
House 3, view of the reception room.

House 3, detail of the stone.

House 3, view of the parking space.

House 4: Abu Anas

Area of house: 175 square meters
Number of rooms: 5, in addition to a kitchen and three bathrooms
Number of inhabitants: 8
Year(s) built: 1985, 1992, and 2011



House 4, Isometric view.

Running costs in summer and winter, per month
Electricity: 60 – 70 JD in the summer, and 45 - 47 JD in the winter
Water: 25 JD in the summer and 12 JD in the winter
Heat source: Gas heater (60 JD per month)

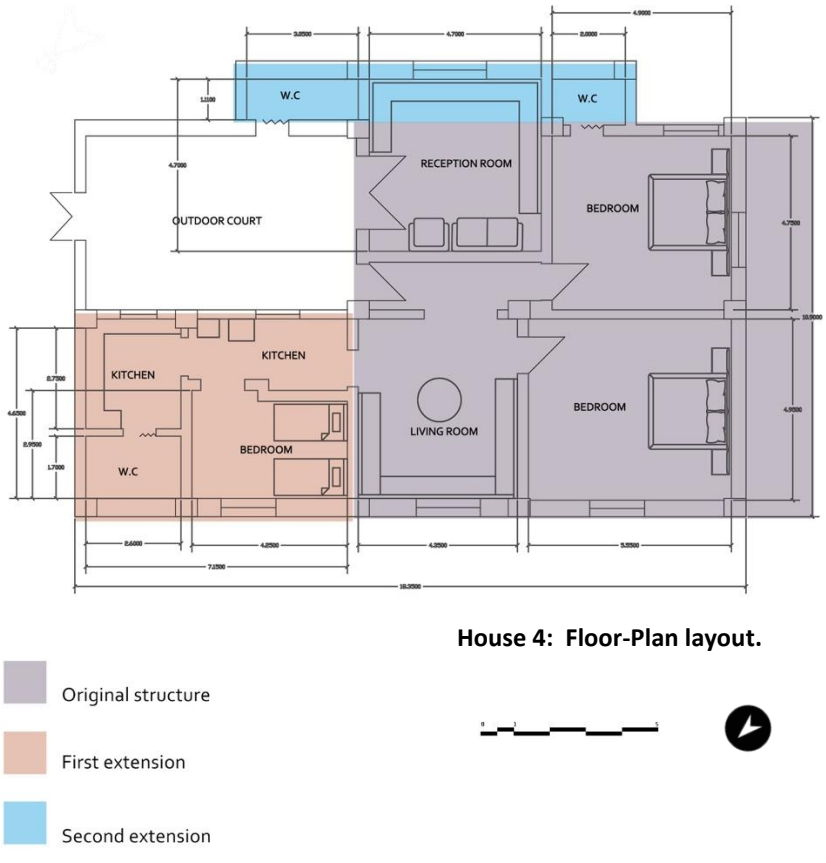
The family consists of Abu Anas, his wife Umm Anas, as well as their two sons (one of whom got married and moved out; see House 4.1: Anas) and five daughters.

Abu Anas inherited an 800-square-meter plot of land from his father in 1985. A year after that, he started the construction of a five-room house with an area of about 200-square-meters. Initially, he could only afford to construct one of the rooms, which was completed in 1986. In 1992, he started working on constructing two additional rooms, and two other rooms were added in 2011. He also reworked the front garden at that time by adding a new fence, planters, a canopy, and tiling. These latest two rooms cost around 3,000 JD to build, and the garden additions / improvements cost around 800 JD. The total building costs amounted to about 10,000 JD. The selection of the builder was based on personal connections and on his reputation. The land on which the house is located is estimated to be worth around 15,000 JD today.

The roof was then used to house a 100-square-meter house for his eldest son Anas and his family (more on that below). The family recently installed a solar heater through a loan offered by YWA.

The house faces problems relating to water leakage, high electricity bills, and electric leakages through the walls resulting from faulty wiring. Moreover, and most importantly, the cesspit is too small to meet the family's needs and suffers from leaks. Work is now being carried out to rehabilitate and enlarge the pit, which is estimated to cost about 3,000 JD.

Another priority for the family is to redo and expand the kitchen or construct a new one. The current kitchen is poorly ventilated, and the cooking smells seep into the other rooms because the kitchen faces north



House 4: Floor-Plan layout.

House 4, view of the front porch.

House 4, view of the courtyard.

House 4, view of the reception room.

House 4, view from the courtyard showing the upper floor extension.

House 4, view of the kitchen.

House 4, view of the bathroom.

House 4.1: Anas

Area of house: 115 square meters, plus a 40 square-meter terrace
Number of rooms: 3, in addition to a kitchen and a bathroom
Number of inhabitants: 5
Year(s) built: 2015

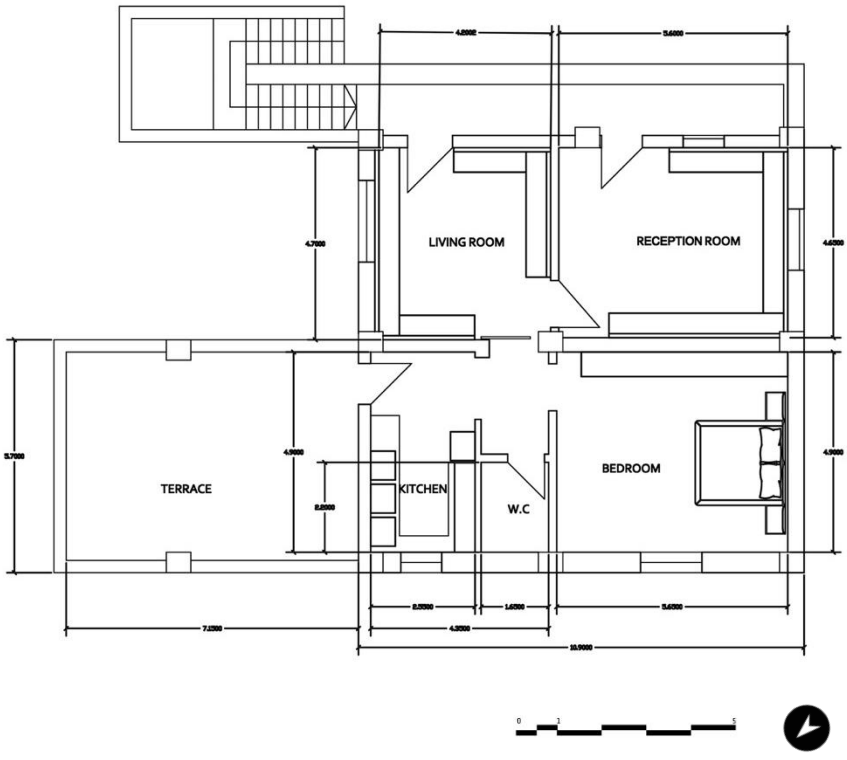
Running costs in summer and winter, per month
Electricity: 36 JD in the summer, and 45 - 47 JD in the winter
Water: 10 JOD in the summer, and 10 JD in the winter
Heat source: Olive husk 45 JD / ton, and firewood 55 JD / ton (consumption of 1.5 tons per season).

In 2015, Abu Anas applied for a loan through YWA / Habitat Jordan to build the extension above his house for his son and his son's family mentioned above. The family consists of Anas, his wife, and their three children.

The house consists of a bedroom, a living / sleeping space, a reception room, a kitchen, a bathroom, and a terrace. The roof has a separate entrance from the father's house on the ground level.

Construction costs amounted to 70 JD per square meter, 12 JD of which were the builder's fees. The contract with YWA specifies that the owner (in this case Abu Anas) would provide all the needed building materials, while the association would hire the builder and his team. The 6,000 JD loan is to be paid over a period of 82 months, with a monthly payment of 75 JD. Anas's wife is managing the finances of the household. She was very involved in developing the designs for this addition. She accordingly asked the builder to incorporate an incline in the house's flat roof to avoid water leakage, based on her family's and friends' recommendations.

As their family is expanding, Anas and his wife are saving up to add another bedroom, which would cut their terrace area in half. Their other priorities include incorporating a fully functional kitchen since their current one does not have any cabinets and does not have enough worktops.



House 4.1, floor-plan layout.

House 4.1, side view of the stairs leading up to the entrance of the extension to the house for Anas and his family.

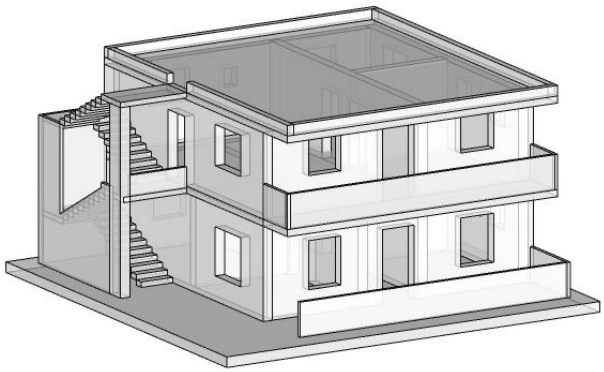
House 4.1, from the terrace.

House 4.1, view of the kitchen.

House 4.1, view of the living space.

House 5: Ibrahim al-Momani

Area of house: 80 square meters
Number of rooms: 3, in addition to a kitchen and a bathroom
Number of inhabitants: 5
Year(s) built: 2014



House 5, isometric view.

Running costs: Unavailable

Prior to 2014, the family was renting a small house in a neighboring village to Umm al Yanabi'. In 2014, after Ibrahim's wife inherited a 1.25-dunum plot of land from her father, Ibrahim and his family decided to build their own house. They considered this option to be financially better than renting in the long run since they paid 150 JD per month for a rental apartment.

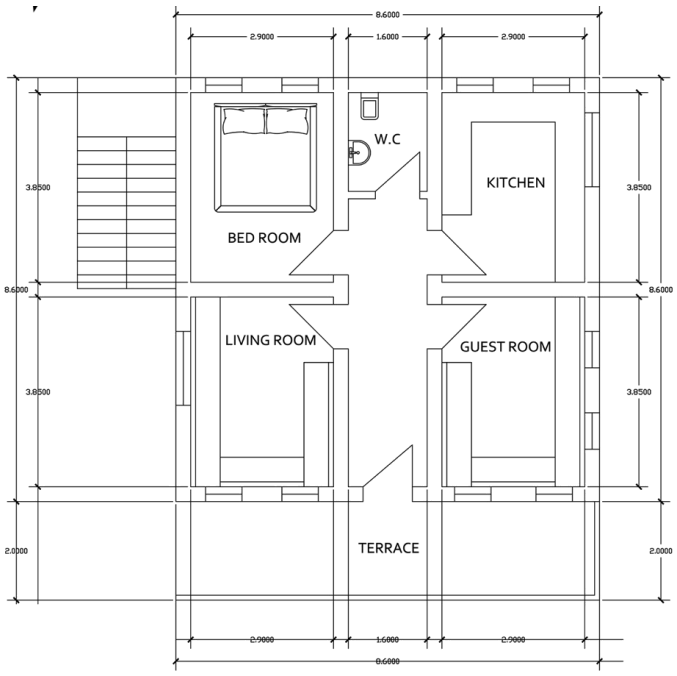
The built house is 80 square meters, and consists of a reception room, living / sleeping space, bedroom, kitchen, and a bathroom. The family initially covered the costs of excavation work as well as structural work, which came to a total of around 3,000 JD. After that, the family applied for a loan through the YWA (with a total value of 6,000 JD, and a loan fee of 600 JDs). This covered cinder block work and finishing work. The loan was to be paid over a period of five and half years, with monthly payments of 100 JD. Other finishings, such as the kitchen and bathroom fixtures, were installed later according to the family's financial capability.

During this period, YWA had attended a workshop on energy-efficient houses conducted by the Green Building Council. Ibrahim's wife accordingly consulted with the women running YWA to apply some of the recommendations provided by the Green Building Council (GBC) to their house, which was to be constructed. As a result, the kitchen and bathroom were oriented towards the east, maximizing natural ventilation and helping eliminate odors from spreading throughout the house. The bedroom was also oriented towards the east so as to take advantage of the morning sun. Moreover, the living room was oriented towards the west, and the reception room towards the south to maximize heat gain during the cold season. The family in addition decided to incorporate narrow high windows instead of the horizontally-oriented windows in order to increase thermal and water insulation, and to improve natural light conditions and natural ventilation. The narrow width of the sills minimizes the surface area through which water leakage may take place. Moreover, the long, thin openings admit more light than wide, short ones; and the vertically-oriented proportions allow for more air currents to enter, thus enhancing natural ventilation.

The family, however, decided not to follow any of the other recommendations provided by GBC as they would add to the construction costs. These included improved water and thermal insulation, as well as the installation of a graywater treatment system.

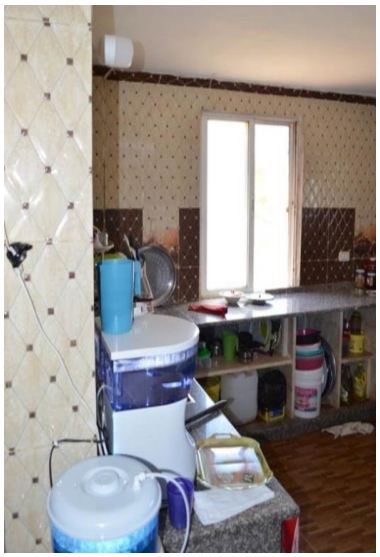
The house was primarily completed by the end of 2014, but Ibrahim's wife is still hoping for upgrades in the kitchen in terms of cabinets and working tops, and plans to add parapets to the stairs leading to the roof for safety.

In late 2016, Ibrahim's son built an expansion on his parents' roof, and moved in with his new family. This extension followed GBC's recommendations regarding plan layout and orientation, but not regarding window design or water and thermal insulation. This extension was funded through a loan from YWA and Habitat Jordan.



House 5: Floor-plan layout.

House 5, view of the northern and eastern elevations.



House 5, view of the kitchen.

House 5, street view.

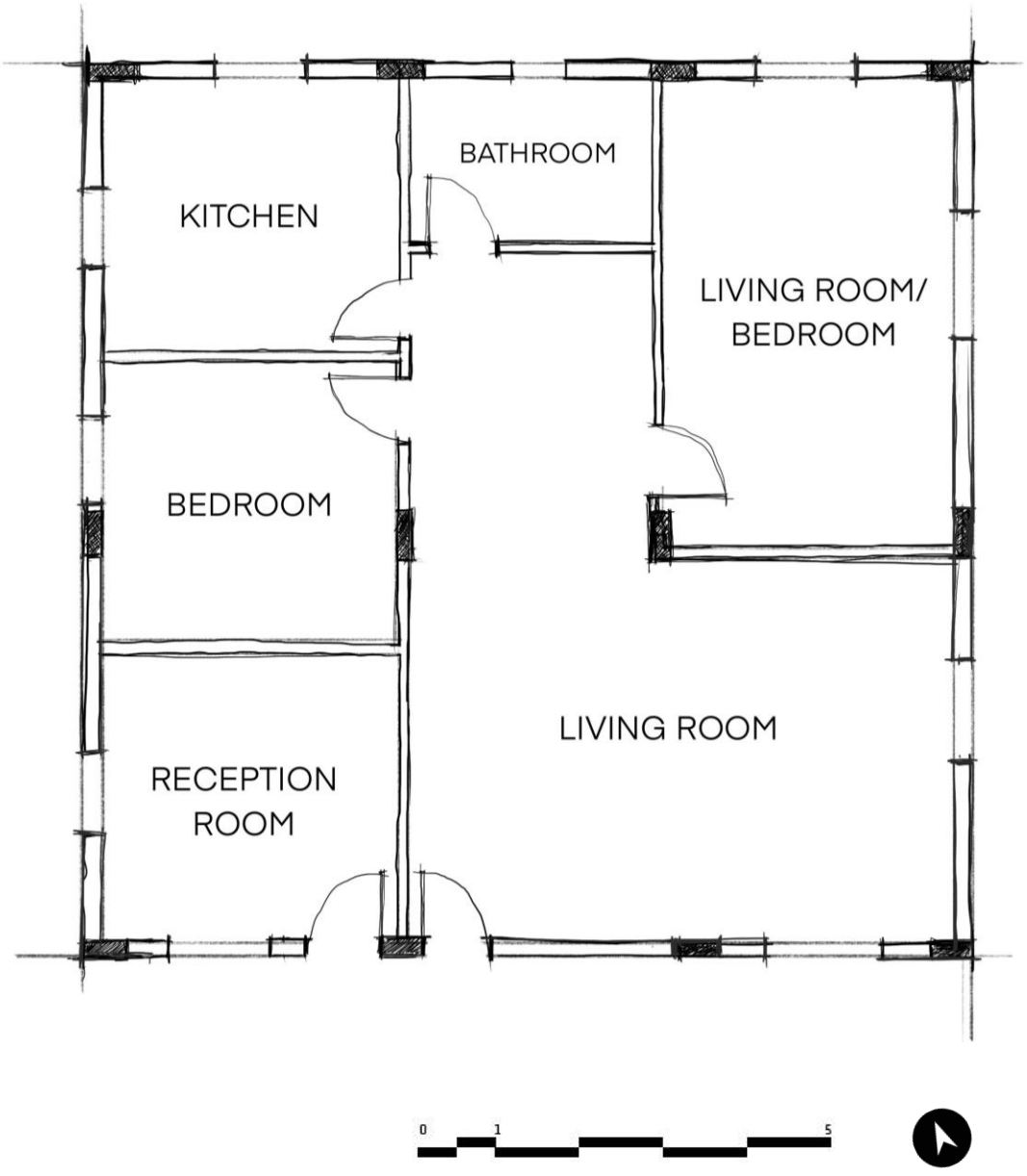
House 5, view of the long, narrow windows.

Other mapped houses – plan layouts:

Several additional houses were mapped around the village in an attempt to identify possible patterns regarding their planning. In addition, images were taken of these houses to show their different exterior finishes. We noticed, for example, that the cinder blocks used in the construction of a number of the houses are left un-plastered; that some houses are plastered or painted only in patches; and some are clad in stone and, in some cases, in marble. The type of finishing applied usually depends on the financial abilities of the owner.

House 6: Raed

Number of inhabitants: 4
The house is a variation of the traditional three-bay house. In the traditional three-bay house, however, the central bay consists of a living / reception area, with the bedrooms, kitchen, and bathroom occupying the side bays. In this case, the central bay contains a bathroom, a sizable space that inefficiently provides circulation, and part of the living room.

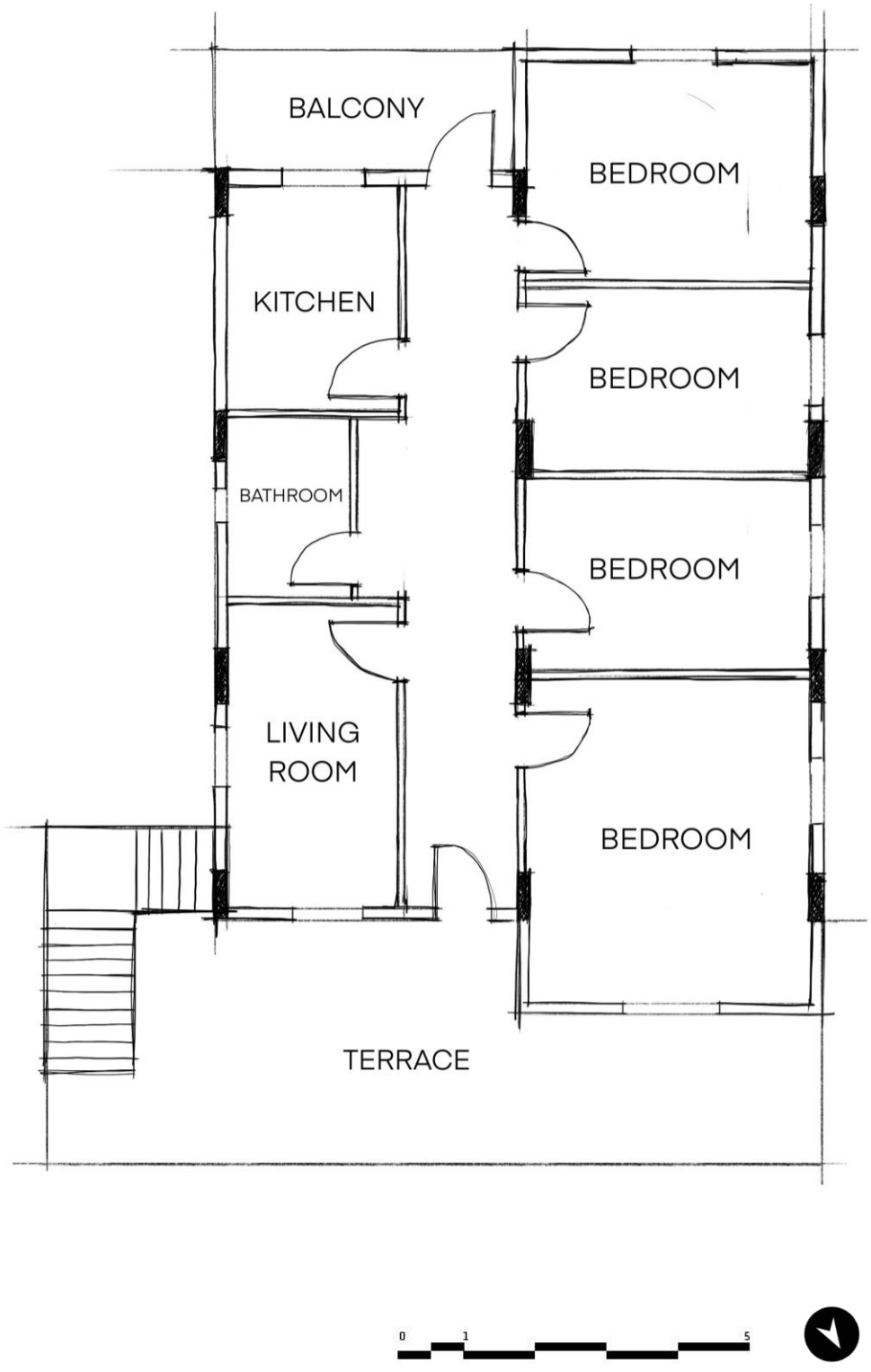


House 6, front view.

House 6, back view.

House 7: Abu Husam

Number of inhabitants: 7
This house is essentially a two-bay house with a corridor extending across the length of the house and taking up a whole longitudinal strip of the southeastern bay.



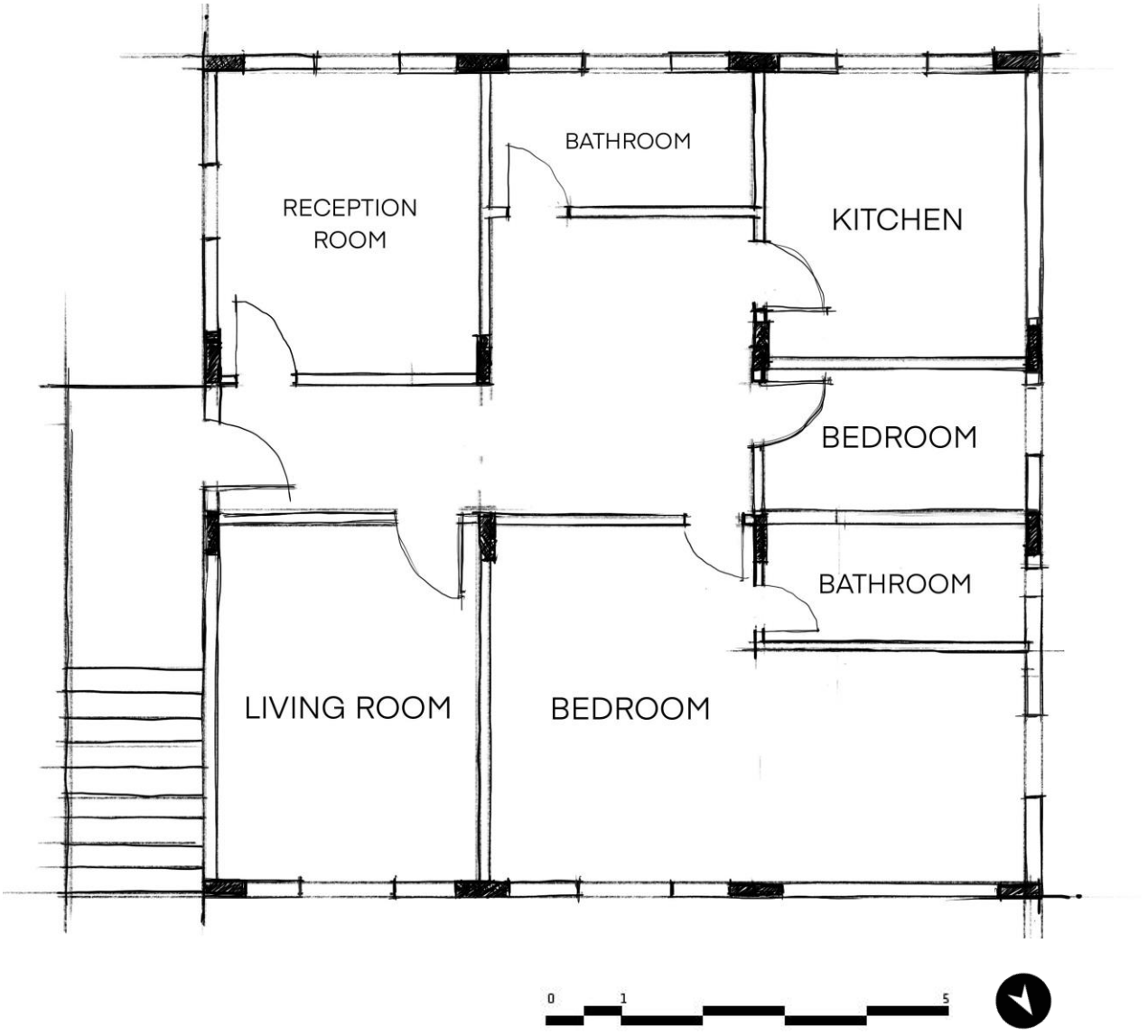
House 7, front view.

House 7, Side view.

House 8: Rakan

Consists of two floors following the same layout.
Number of inhabitants in the ground-floor dwelling: 6
Number of inhabitants in the upper-floor dwelling: 4

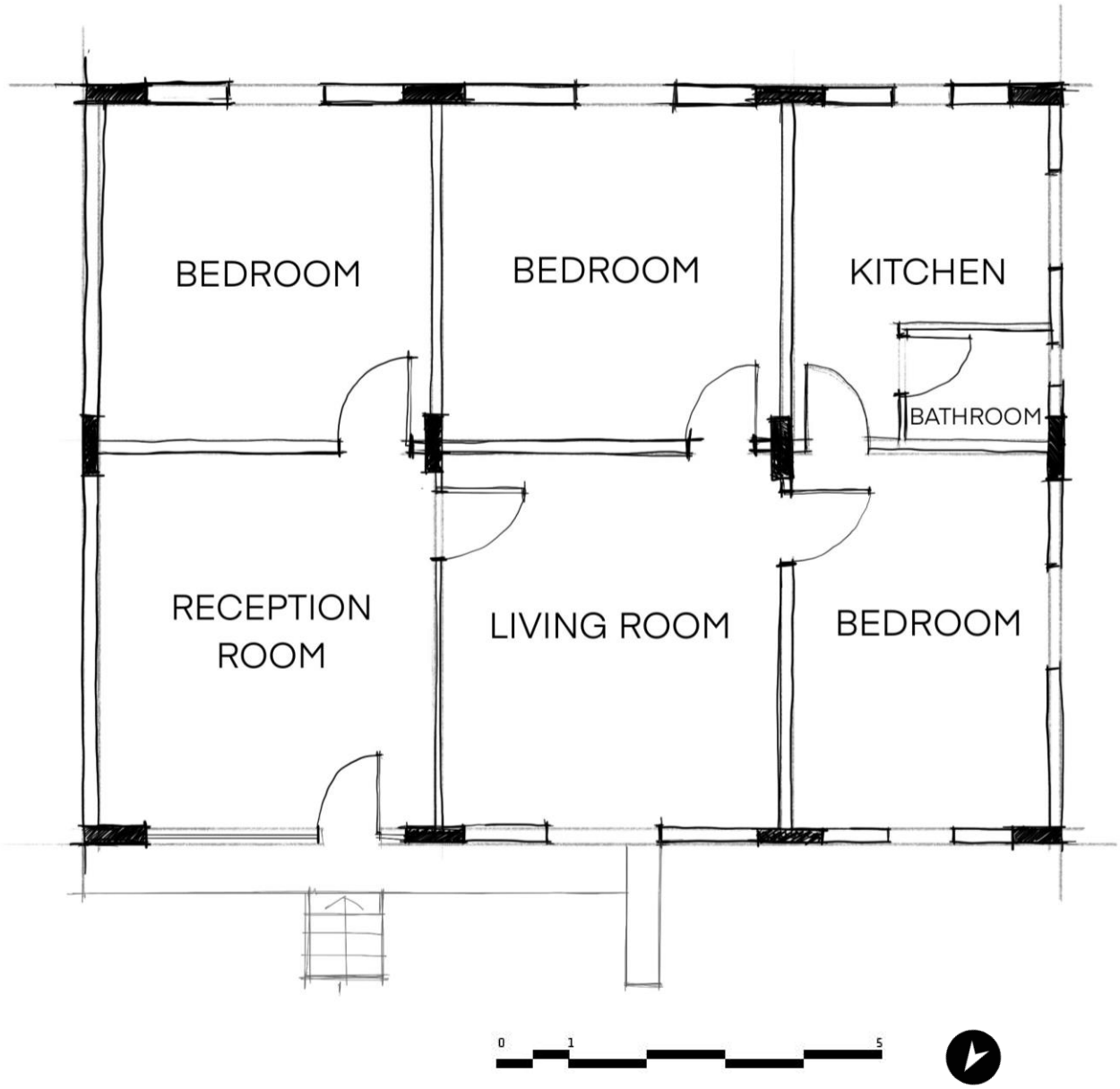
This house structurally consists of three bays, with the large northern bedroom extending across two bays and including its own ensuite bathroom. Otherwise, the central bay includes the bathroom and a rather large chamber that primarily and inefficiently serves as a circulation space.



House 8, front view.

House 9: Abu Rakan

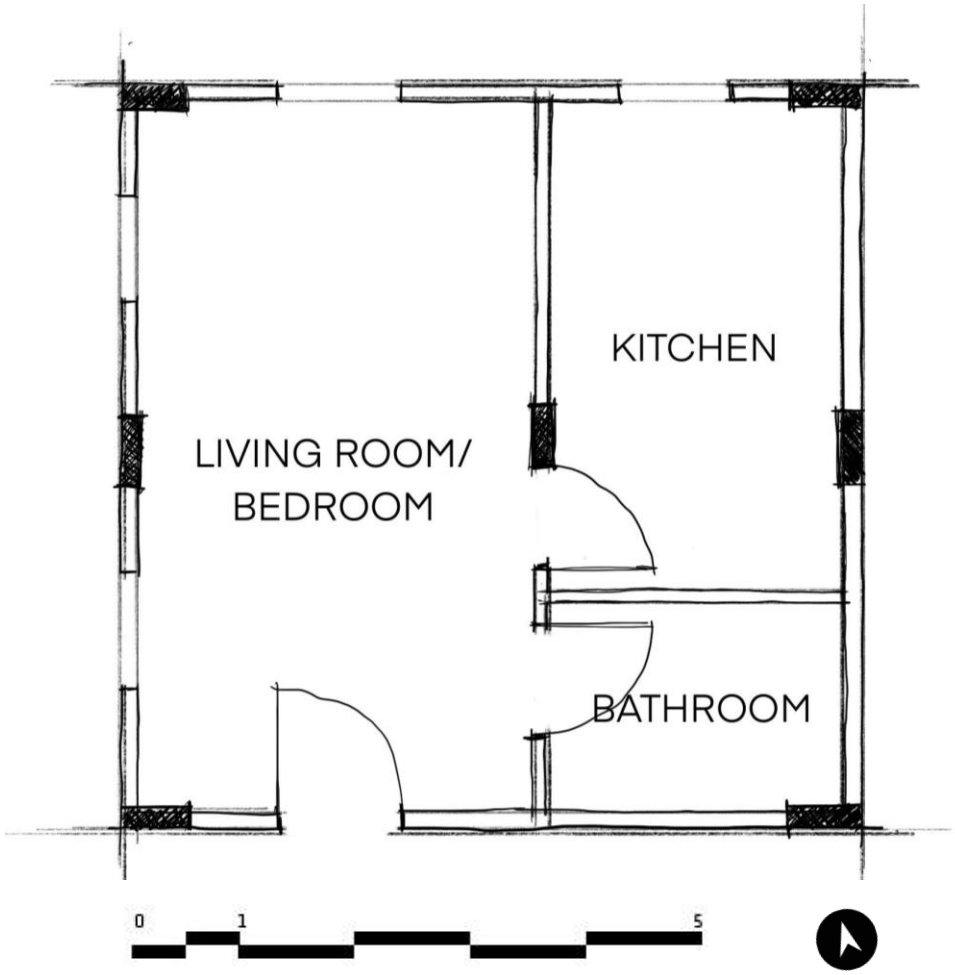
This house originally had a square layout until the extension to the southwest transformed it structurally into a three-bay house. Note that one cannot enter the southern row of rooms except through the northern row of rooms.



House 9, front views.

House 10: Mahmud

Number of inhabitants: 1 (a single man's house)

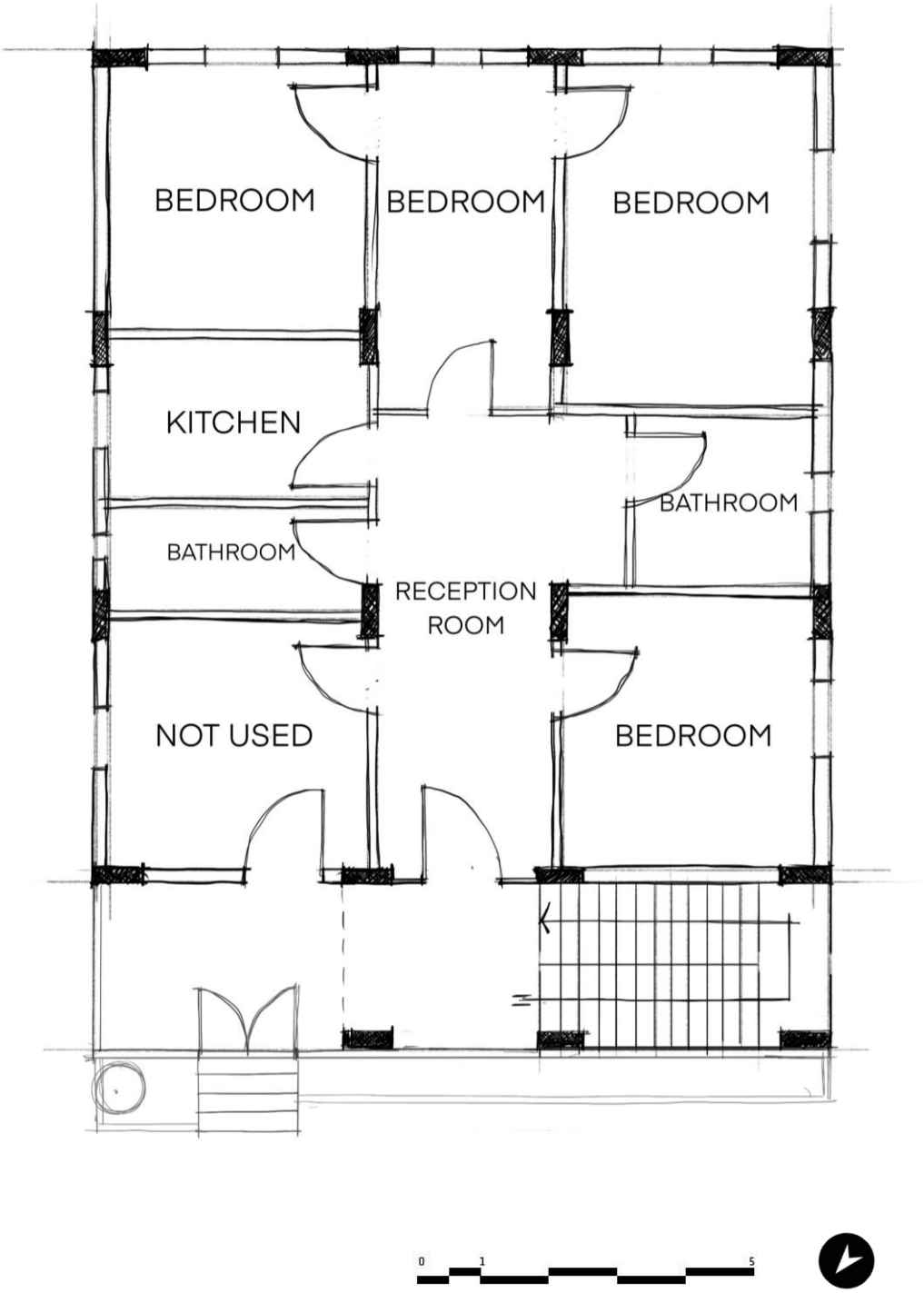


House 10, front view.

House 11: Omar Yousef

Number of inhabitants: 6

This house is structurally also a three-bay structure, with the central bay occupied by a bedroom and longitudinal space that inefficiently takes on the role of a reception room.

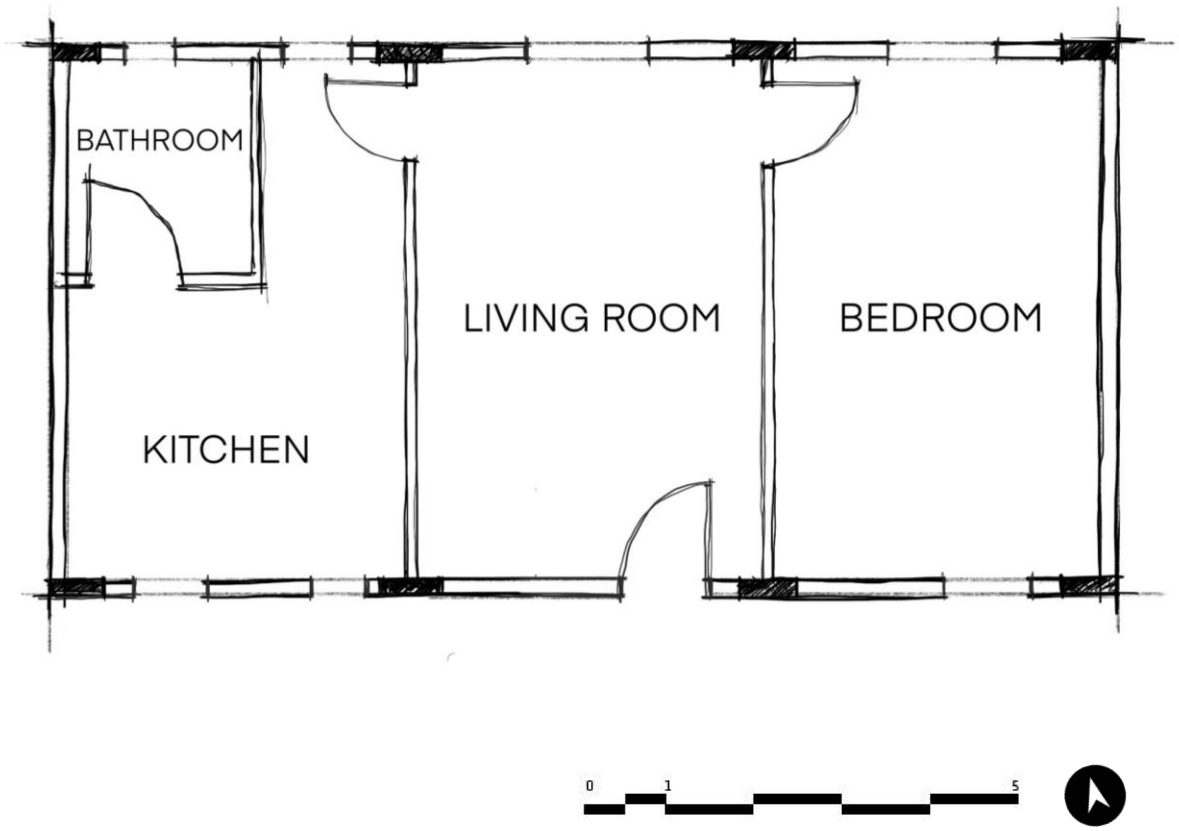


House 11, front view.

House 11, front view.

House 12: Abu Zaid

This house follows a simple three bay plan in which each bay consists of one room, with the common, but problematic, arrangement of the bathroom included within the kitchen space.

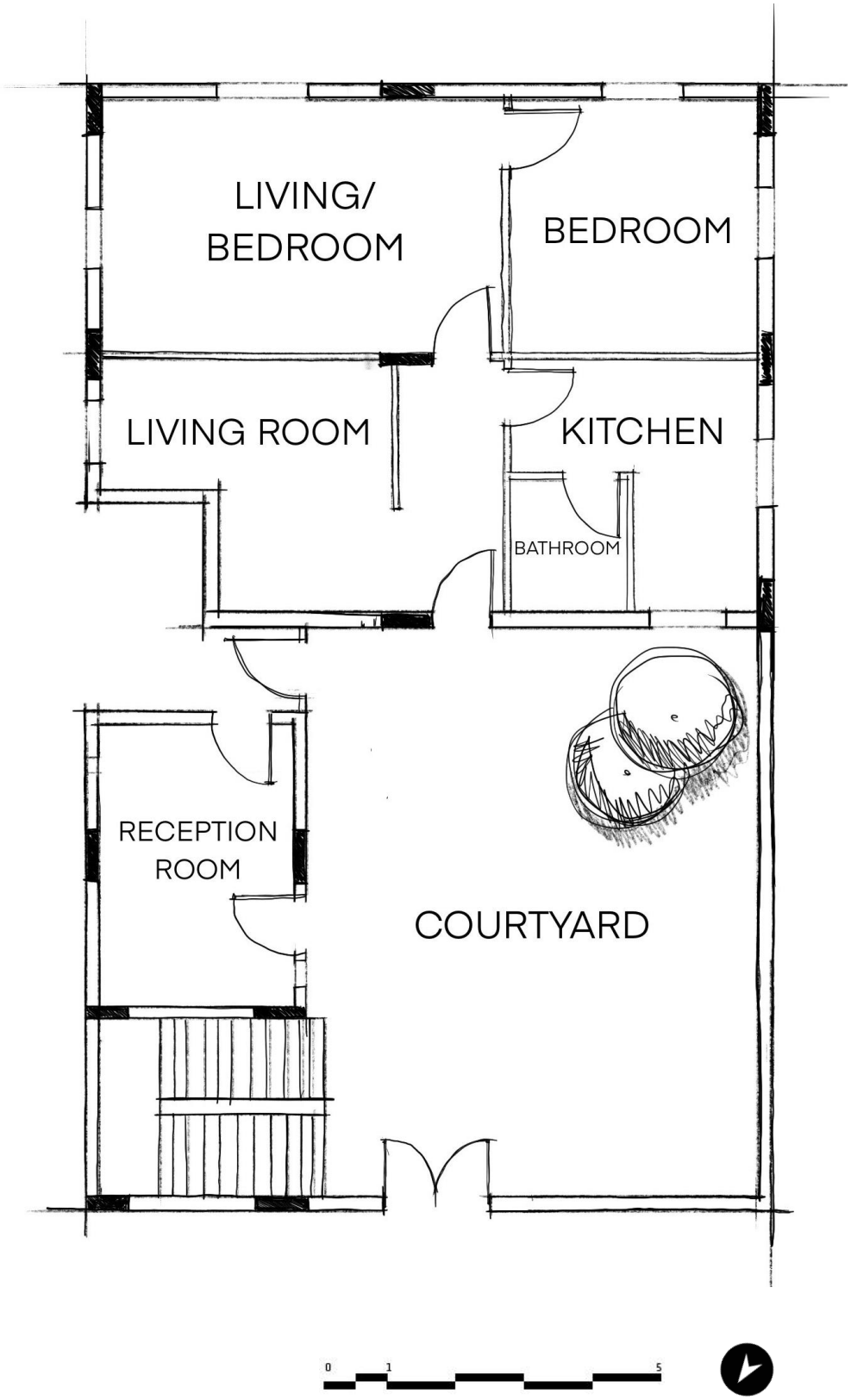


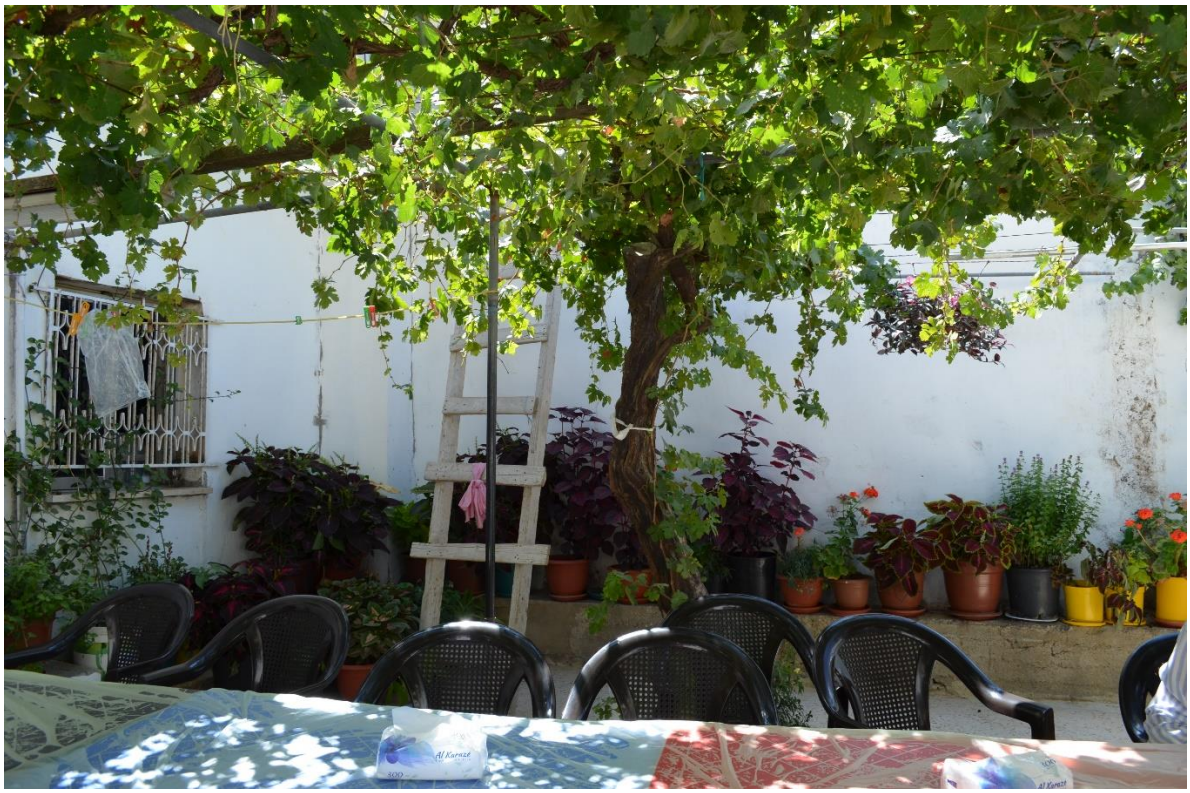
House 12, front view.

House 12, front view.

House 13: Abu Mahmud

The original house was structurally a two-bay house divided into four rooms, with the southwestern rooms (kitchen, bathroom, and bedroom) occupying a smaller area than the two northeastern rooms (living / bedroom and living room). The wall constructed in the already irregularly-shaped living room creates a corridor that provides access to three of the rooms of the house. The southern bedroom can only be accessed through the living / bedroom; and, as is the case in numerous other houses, the bathroom can only be accessed through the kitchen. An extension including a courtyard, a reception room, and a staircase was added at a later stage.





House 13, view from the courtyard.

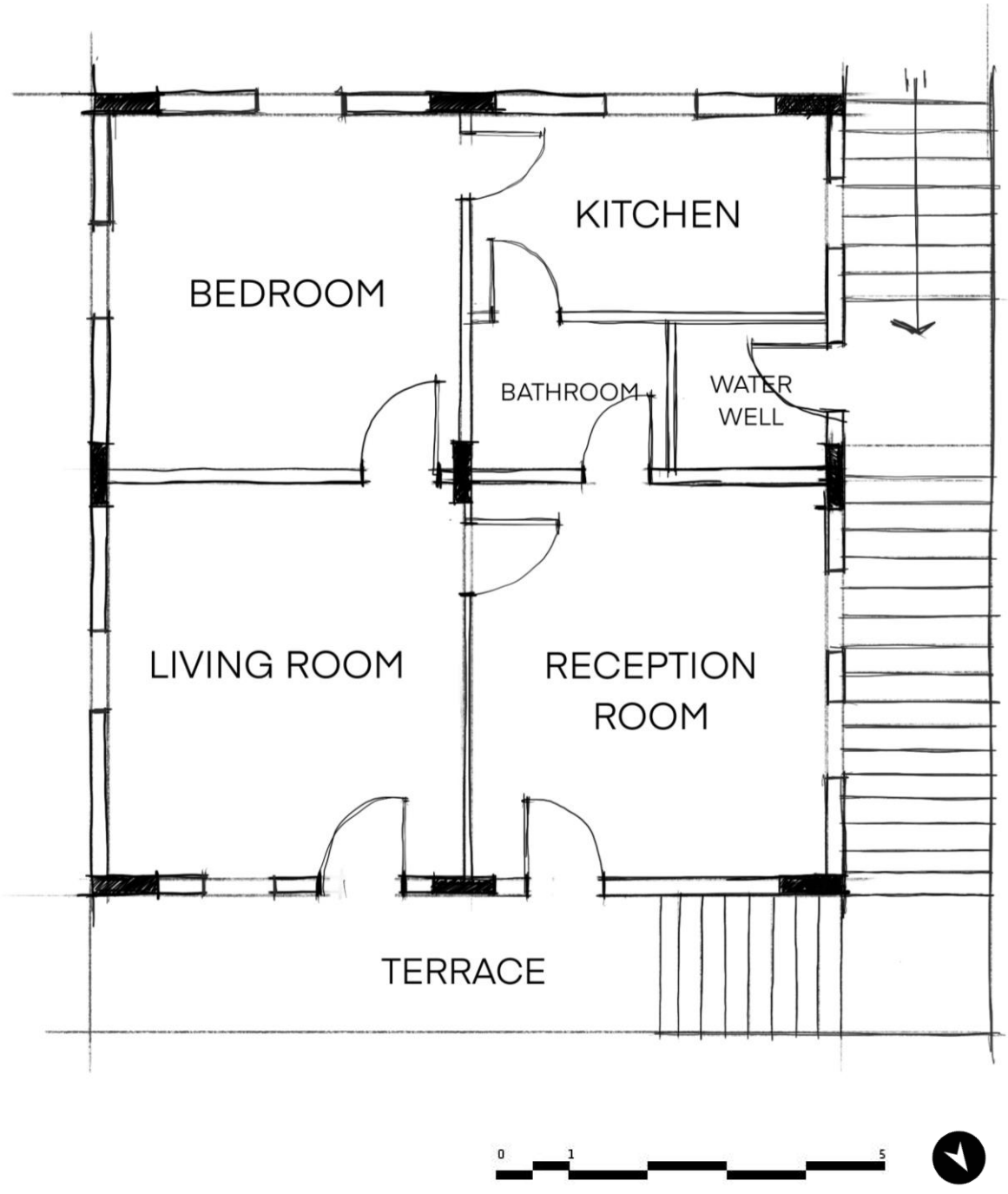
House 13, entrance view.

House 13, view from the guest room.

House 14: Abu Nadeem

Consists of two floors following the same layout.
Number of inhabitants in the ground-floor dwelling: 4
Number of inhabitants in the upper-floor dwelling: 3

This two-bay house is divided into four units. Rooms occupy three units, and the kitchen and bathroom occupy the fourth. The bedroom may only be accessed through the living room, and the kitchen may internally only be accessed through the bedroom, although it also may be directly accessed from the outside of the house.



House 14, side view.

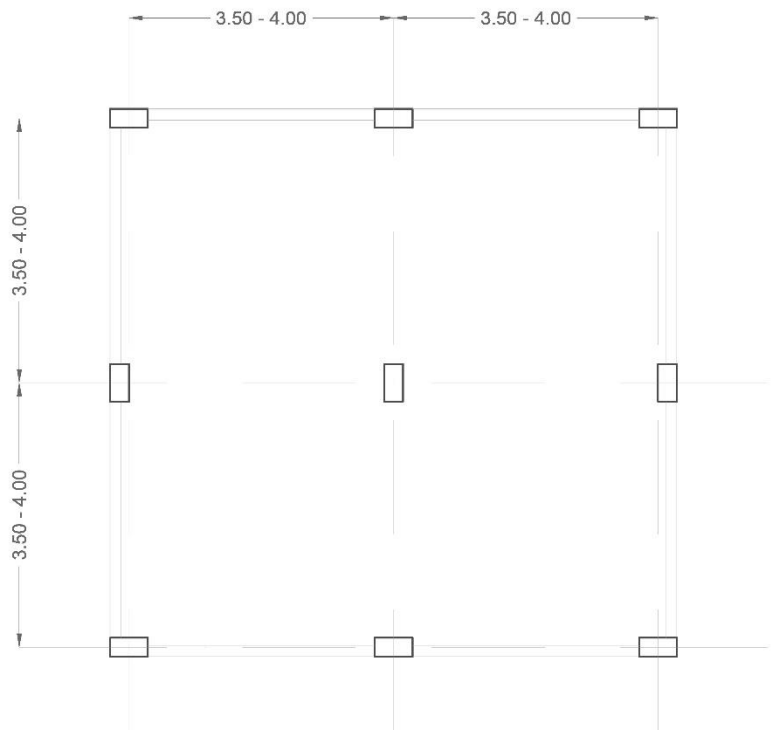
House 13, entrance view.

A search for patterns:

We noticed that the original houses follow a simple structural, though not necessarily functional, layout – usually based on a 3.5 to 4.5-meter structural unit that is determined by the length of the reinforced concrete beams used in their construction. Very often, the kitchen and bathroom are included within one structural grid unit. This arrangement is used to save on the use of piping for water supply and sewage disposal, but having those two functions in such proximity to each other is not ideal from a sanitary point of view. We also noticed that most rooms can only be accessed from another room in the house. This arrangement of course saves on the use of circulation space, but negatively impacts issues such as privacy and the efficient use of the space providing access to another space.

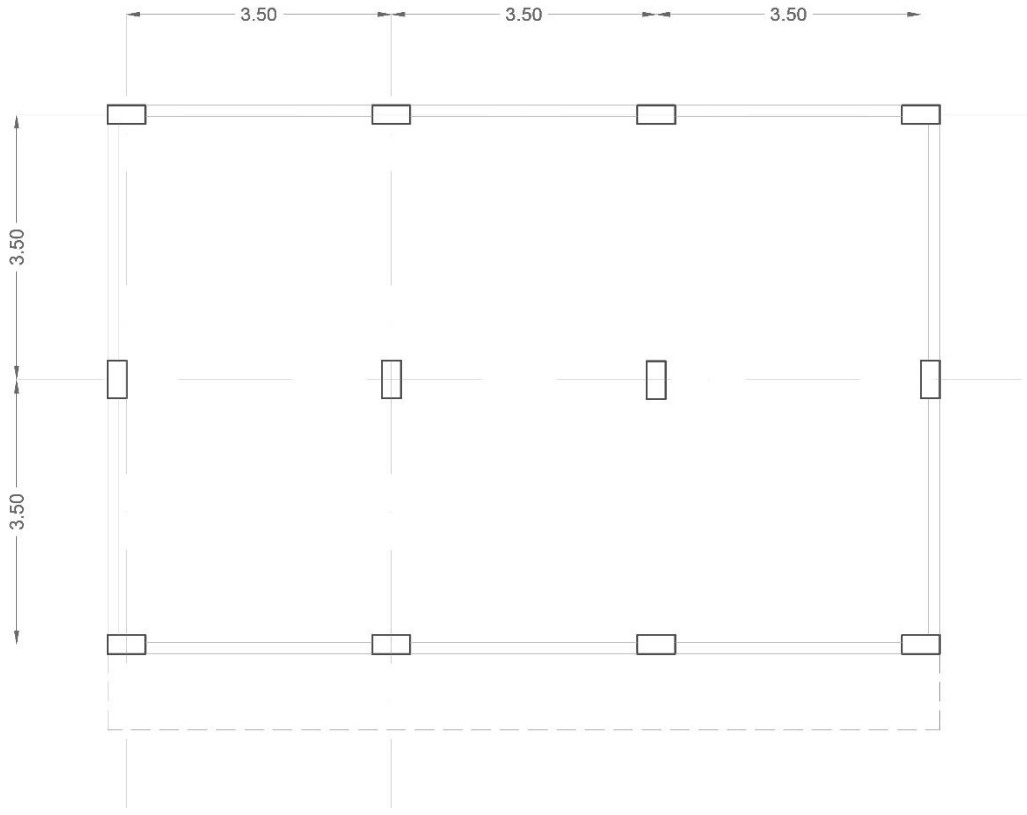
Extensions are built according to the specific needs of each family and also according to site constrains. They consist of both vertical and horizontal expansions, and may range in size from an extra room to a full housing unit. The extensions are also constricted by the maximum span of 4.5 meters for structural beams. Otherwise, we could not identify any given pattern governing them.

Common structural layouts used for the houses:



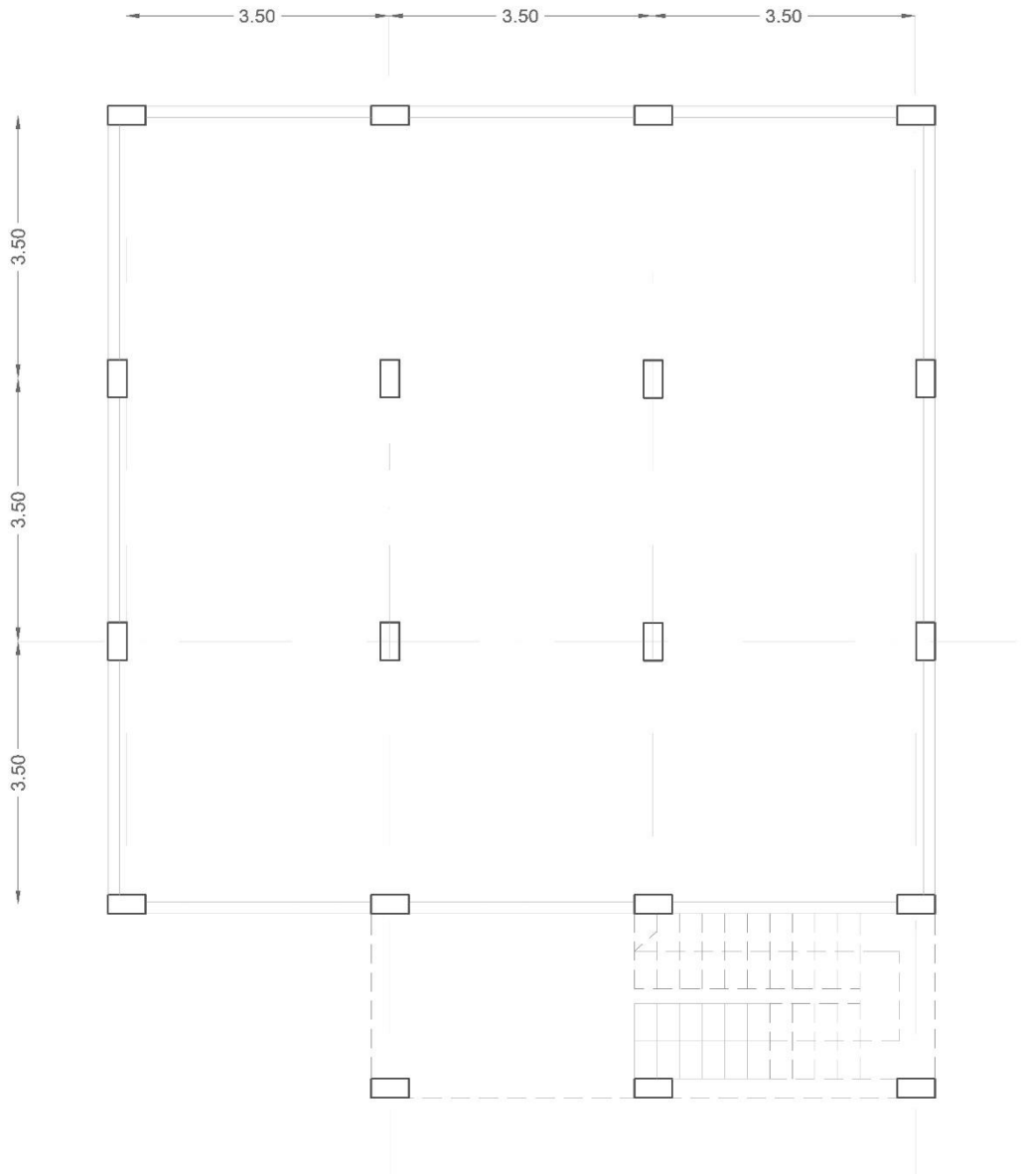
Variant 1.0: A nine-column structure consisting of four bays of equal size.

Variant 2.0: An eight-column structure consisting of three bays of equal size.

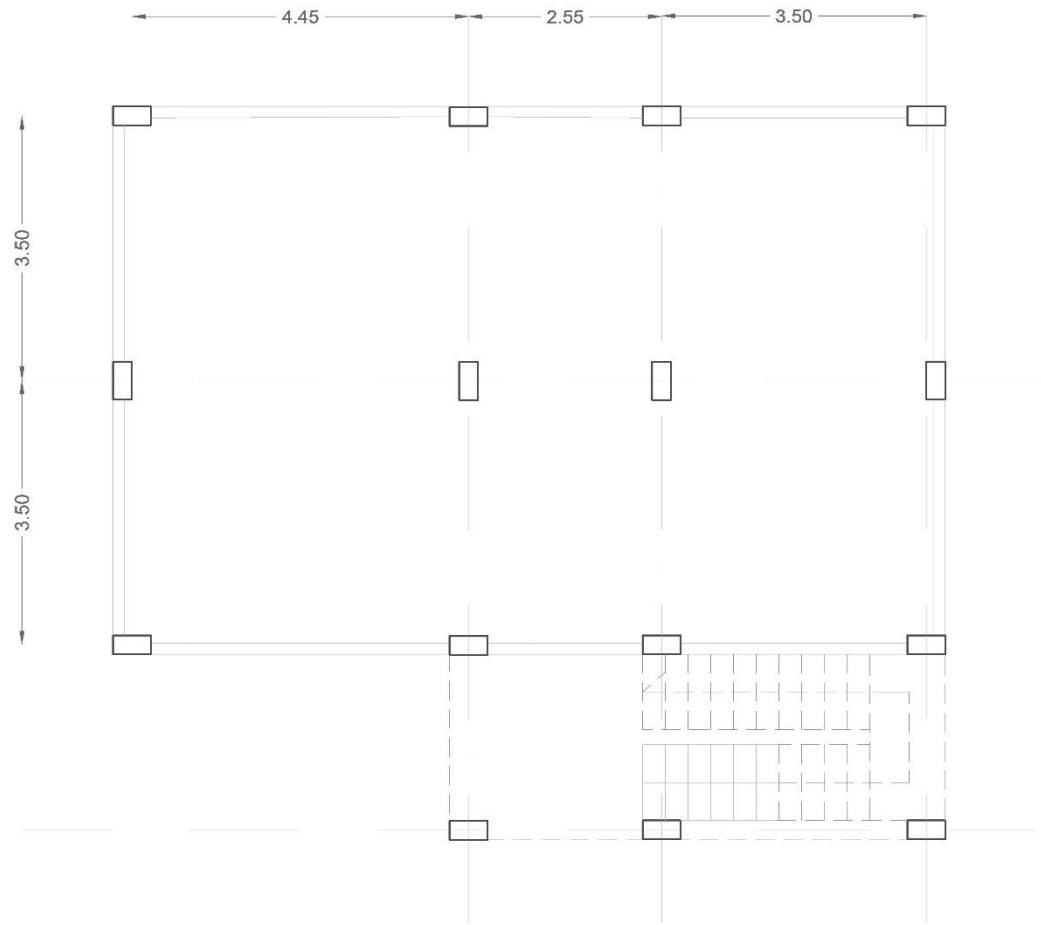


Variant 3.0: A twelve-column structure consisting of six bays of equal size. The roof may be cantilevered slightly to form a canopy.

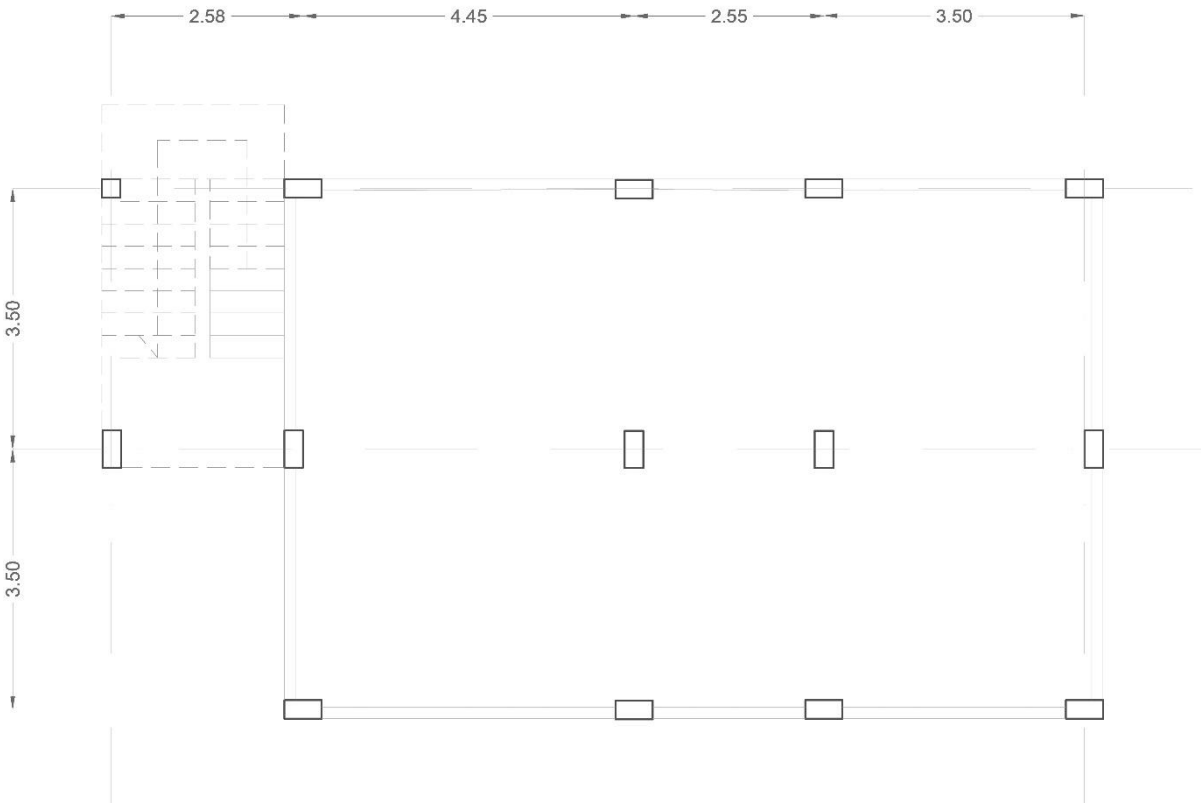
Variant 3.1: A twelve-column structure consisting of six bays of equal size. Three columns may be added longitudinally to form two smaller bays, one of which houses a staircase, and the other takes on the role of a covered entrance balcony.



Variant 4.0: A sixteen-column structure consisting of nine bays of equal size. Three columns may be added to form two smaller bays, one of which houses a staircase, and the other takes on the role of a covered entrance balcony.



Variant 5.0: A twelve-column structure consisting of six bays of three differing sizes. Three columns may be added (in this case laterally) to form two smaller bays of differing sizes, one of which houses a staircase, and the other takes on the role of a covered entrance balcony.



Variant 5.1: A twelve-column structure consisting of six bays of three differing sizes. Two columns may be added (in this case longitudinally) to form an additional bay that houses a staircase.

The local builder: Abu Mahmud:

Abu Mahmud (mentioned above) is the local builder in Umm al Yanabi', and is hired by YWA to carry out their housing projects. When taking on a project, Abu Mahmud starts with an initial site visit. He assesses the conditions and limitations of the land, and gives an offer for his fees based on the amount of work he is to carry out:

Offer 1:
- Responsibilities of the builder: foundation work, structural skeleton work, and concrete cinderblock work (single-layered walls).
- Responsibilities of the homeowner: excavation work and the supply of materials.
- Finishing work not included.
- Fees: 15 JD / square meter.

Offer 2:
- Responsibilities of the builder: foundation work, structural skeleton work, concrete cinderblock work (single-layered walls), and the supply of materials.
- Responsibilities of the homeowner: excavation work.
- Finishing work not included.
- Fees: 75 – 80 JD / square meter (if the soil type is red soil); if there is bedrock, the fees would rise by 15 – 20 JD /square meter.

Offer 3:
- Responsibilities of the builder: foundation work, structural skeleton work, concrete cinderblock work (single-layered walls), the supply of materials, and finishing work.
- Responsibilities of the home-owner: excavation work.
- Fees: 135 – 155 JD /square meter (if the soil type is red soil); if there is bedrock, the fees would rise by 15 – 20 JD /square meter.

Structural work usually takes 40 – 50 days, and finishing work takes approximately 30 days. The general design and layout of the dwellings are a variation of a simple square-shape plan that usually occupies an area of around 85 square meters but does take into consideration any site constraints or particular requirements by the owner. Formal or aesthetic considerations do not seem to be a priority at all.

The houses use a post-and-beam structural system, with reinforced concrete as the main building material. Materials are usually purchased from local suppliers in the same town or from neighboring towns. Building equipment (such as scaffolding, metal bending equipment, mixing equipment, trolleys, formwork wood, etc.) is usually rented from nearby towns. The builder prefers employing the same construction crew for his projects. These crew members (both Jordanians and expatriates, mostly Egyptians) are not necessarily from the town, and might have to go through a long commute to reach the site.

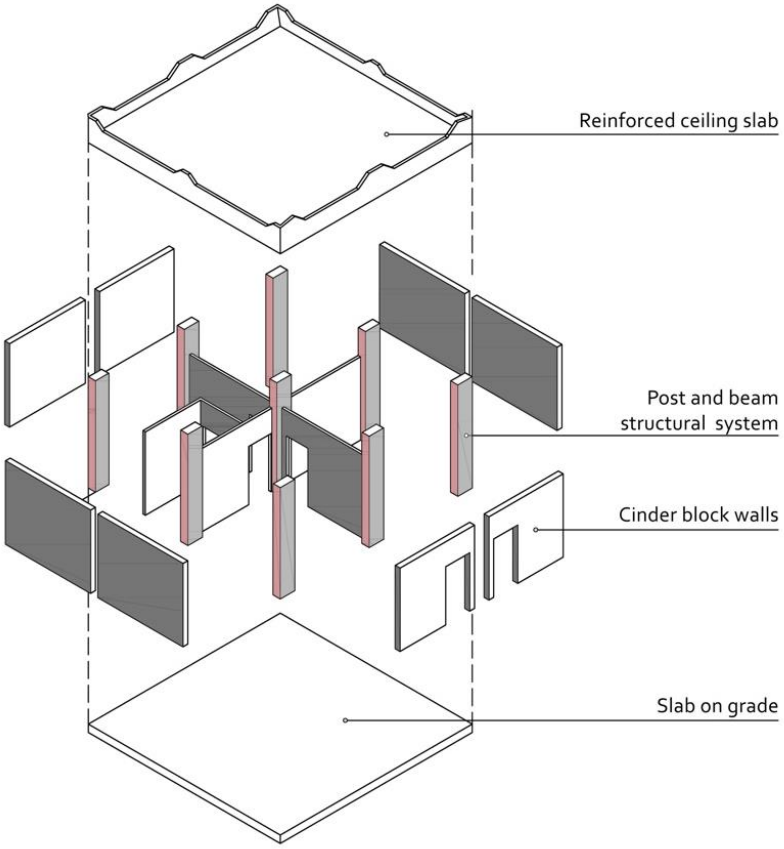
Extra waste produced as a result of the construction process is usually used to fill the areas between the foundations or to fill any hollow areas in the site.

Building materials and systems:

Structural system:
The houses use one of three foundation systems: slab on grade, foundation walls and fill, or footings and beams (all following comments only refer to a slab on grade system). The choice of one over the other is mainly determined by soil type, number of stories, and if there are future plans for vertical expansion. The slab on grade structural system, however, seems to be the most widespread for foundations. The houses use a post-and-beam structural system with a grid of a 1.5 – 4.5-meter span. The columns have a section of 0.25 * 0.5 meters reinforced with six 14 or 18-millimeter steel bars and include an average of five structural iron stirrups per meter. The number of stirrups may be increased based on the owner's request. The main load-bearing beams are reinforced with five upper and five lower steel bars. The secondary beams are reinforced with four upper and four lower, three upper and four lower, or three upper and three lower steel bars.

The concrete slabs are usually reinforced with 18-millimeter steel bars. If the owner is on a tight budget, however, 14-millimeter bars are used instead. The houses generally are over-reinforced.

The cinder block walls are usually built up with one layer of 15-centimeter-thick blocks. These are usually plastered and may be painted. If thermal proofing is requested, two layers of 10-centimeter-thick cinders with an air space of 5 centimeters in between are used. No waterproofing is applied other than an inclined flat roof to avoid water leakage. Moreover, we noticed that window frames generally do not correctly fit within the designated window openings, which results in water seeping between the frames and openings, and into the house.



An exploded isometric showing a generic structural system for a house.

Plumbing and electrical systems:
Plumbing fees are either 10 JD / outlet, or 2 JD / meter (excluding materials). Electrical fees are 2.5 – 3 JD / outlet (excluding materials).

Finishing work:
Finishing costs are between 60 – 75 JD / square meter. In addition to cinder blocks and reinforced concrete, other building and finishing materials include terrazzo tiles or porcelain floor tiles; single-glazed aluminum windows; steel main doors, and wooden or PVC interior doors; and bathroom fixtures (toilet seats, squat toilets, bidets, bidet hoses, shower boxes, shower area, bathtubs, wash basins, etc.). These are specified and agreed upon in the initial agreement / brief through appendices specifying the different items and materials that might be used and the alternatives for each of them. Bathroom fixtures and tiles usually cost around 400 JD.

Kitchen cabinets are primarily made of aluminum frames and PVC panels. Countertops are made from a range of materials including marble and granite. The cost of installing a kitchen is 500 JD or higher.

Clean water wells and sewage pits:
Clean water wells (mainly for rainwater harvesting) and sewage pits are built through separate contracts. The cost for a 10-cubic-meter well / pit is 100 – 300 JD (depending on the soil type) for excavation work, and around 300 JD for reinforcement. The houses are served by the piped water network, but water is supplied only once each two weeks, so residents need to rely on storing water in wells and / or roof-top tanks.

The local authority: al-'Uyun / 'Arjan Municipality:

The regulatory authority governing the construction process in Umm al-Yanabi' is the al- 'Uyun / 'Arjan Municipality. Municipalities in Jordan in turn follow the regulations imposed by the Ministry of Municipal Affairs (which has been recently renamed the Ministry of Local Administration). Land in the area is mostly zoned as "rural dwelling," and accordingly has a 15% built-up area upper limit. Other land zoning categories are Housing B (with a maximum built-up area of 45%), Housing C (with a maximum built-up area of 51%), and Housing D (with a maximum built-up area of 55%). The different zones are applied mainly in regard to the plot size, and are detailed as follows:

Zone	Minimum lot size	Minimum width of front side	Front setback	Side setback	Back setback	Maximum built-up area	Maximum number of stories	Minimum area of green space
Housing B	750 sq m	20 m	4 m	4 m	5 m	45%	4	15%
Housing C	500 sq m	18 m	4 m	3 m	3 m	51%	4	15%
Housing D	300 sq m	15 m	3 m	2.5 m	3 m	55%	4	-
Rural Dwelling	2000 sq m	30 m	8 m	8 m	10 m	30%	4	10%

The steps a plot owner needs to go through before being able to start construction work are as follows:

Completing the needed paperwork / authorizations:
The owner would start by obtaining a site plan and a clearance from the municipality. Based on that, he would commission the necessary construction drawings (architectural, structural, electrical, and mechanical) for the house from a certified consulting engineering office. There is currently one engineering office in the town of al-'Uyun, providing construction and working drawings for the surrounding area, usually for a fee of 150 JD. The plot owner would then submit the site plans, the land deed, and working drawings to the municipality.

Representatives from the municipality, including its land surveyor, would conduct a site visit, and would check all street levels and land levels, as well as mark the required setbacks.

The application is then processed by the municipality and is usually approved. Considering the tight social and family bonds tying the members of the community, the municipality is generally lenient in granting approvals as long as certain minimum requirements are met such as ensuring that the required setbacks are adhered to, that a 3 * 5-meter parking space is provided for every residence that is accessible from the main street (a parking space is required even in areas zoned as "rural dwelling"), and that all construction waste is disposed properly. The owner would then pay a 30 JD fee (the total amount of municipal fees associated with constructing a house add up to about 150 JD), at which point they could start immediately with the foundation work, followed by structural work and the construction of the ceiling slab. The municipality would then conduct three inspection visits, one at the end of each of these three phases. By the end of the third phase, given that all construction waste has been removed and the required car parking space has been provided, the permit for occupying the dwelling would be issued.

Regarding water and temperature proofing and fire safety, the authorities offer no recommendations or regulations.

It also should be mentioned that land plots in the area are usually inherited and passed on through families. Only about 10% of the land plots are sold or bought rather than inherited. Plot sizes are usually less than one dunum. A dunum in that area currently sells for about 20,000 JD.

General observations and conclusions:

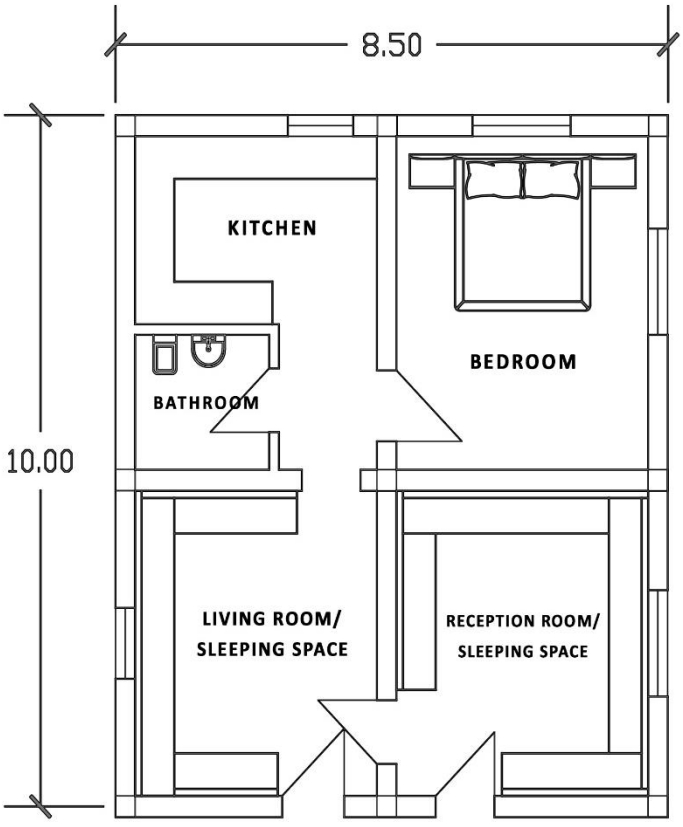
The breakdown of items and costs for a typical house (of 85 to 100 square meters) is as follows:

- Structural system of reinforced concrete with 14 millimeter steel bars.
- Single-layer cinderblock walls.
- Local or imported (usually Chinese) floor tiles.
- MDF interior doors and one steel main door.
- Single-glazed aluminium windows.
- Bathroom fixtures (toilet seat, sink, shower stall, etc.) usually Turkish or Chinese.
- Kitchen countertops (usually made of granite) and a sink, along with cabinets (usually made of aluminium frames and PVC panels).
- A coat of plastering for the exterior surfaces, and a coat of paint for the interior surfaces.
- A cesspit, usually with a capacity of 9 cubic meters.
- A water well, usually with a capacity of 9 cubic meters, and / or rooftop water tanks, usually with a capacity of 1 – 2 cubic meters each.
- A 2-meter-high fence around an area of almost one-dunum (120 – 150 meters in length). This usually consists of a subterranean reinforced concrete beam, reinforced columns at an interval of 4 to 5 meters, and cinderblock between the columns. Not all homeowners, however, opt for a fence.

Construction costs (per square meter) of course can differ considerably from house to house, depending on a variety of factors including the items to be included, quality of construction, and site location. Our discussions with the local contractor provided us with the number of 240 JD / square meter (excluding a well for the property, and a concrete fence around it), but Habitat Jordan has provided considerably lower numbers. They have calculated the average construction cost to be about 142 JD / square meter for an equivalent house. They have also constructed houses with additional water and energy-saving features such as solar panels, tanks for water harvesting, a graywater reuse system, double-glazed windows, door weather-stripping, as well as insulation for the roofs, walls, columns and foundations. These additional features raise the construction costs to 159 JD / square meter, i.e. about 12%.

A large number of these houses feature the same layout with minor variations: an 8.5 (or up to 10) * 10-meter square divided into four quadrants: One acts as a reception room, one as a sleeping / living space, one as a bedroom, and the fourth as a kitchen along with a small bathroom. They usually rely on a structural arrangement consisting of a slab-on-grade and a post-and-beam system. It seems that these systems are cost effective, and local contractors and builders have developed the necessary know-how to apply them.

Other building elements, such as windows and doors, are implemented according to the skill sets of the local builders. Moreover, since short term financial considerations seem to always prevail, the quality of such elements is usually poor, resulting in many problems relating to water and thermal insulation.



A typical house plan layout of 85 square meters.

Families with young adults of both genders usually also use the reception room and the living room as sleeping rooms, each for either gender. It is worth mentioning that each family consists of an average of 5 – 7 members. As the sons marry, the families tend to build one or multiple-room expansions to host the new young families, or build new dwellings.

An important consideration, accordingly, is that these residences need to be expandable (it is also common for households to carry out some improvements to their residences as they expand them). These extensions are done without obtaining any kind of official licences. They could be horizontal or vertical, small or large. In most cases, they are perceived as plug-ins attached to either face of the original 8.5 * 10 * 3-meter box. They also may build separate units on top of, or next to, their original residences for their children once they have their own families.

We have noticed that a number of the original houses follow the pattern of an approximately 85-square-meter unit that takes on a near-square outline and that is divided into four quadrants, with three rooms occupying three of the quadrants, and a kitchen along with a bathroom occupying the fourth. Another pattern is that of featuring a square or rectangular plan that is divided into three sections, with the central section sometimes devoted to circulation. We, however, have not been able to identify any patterns for the extensions as often is evident in numerous vernacular architectural traditions (see, Stewart Brand, *How Buildings Learn: What Happens after They're Built*, New York: Penguin Books, 1994, pp. 136 – 37). The extensions instead seem to be carried out in a haphazard manner, which may indicate that a new tradition of building that is to replace pre-modern vernacular ones in the region has yet to emerge.

Not surprisingly, short-term costs seem to be a dominant concern for the residents of such communities. This is understandable considering that most of them deal with difficult financial conditions, which means that they most often decide to save now even though such short-term savings may result in additional costs later. Such costs include having to address issues relating to water leakage or the ever-increasing costs of heating resulting from poor thermal insulation. As is the case relating to market conditions generally, demand shapes supply, and as a result, poor-quality construction becomes the standard and the norm.

Based on the square meter costs noted above, we have found that the cost of the average house starts at about 12,000 JD, excluding the cost of the land, and can go up considerably higher. These costs are often covered in instalments as different construction phases are carried out over considerable periods of time. This long duration of the construction process makes it more difficult for owners to keep track of the total final cost of the house. Loans that are repaid in monthly instalments are also used to cover the costs of construction.

Because of this issue of cost, upkeep and maintenance receive very little attention, which of course brings about increased repair costs at a later stage. Such issues appear to be de-prioritized in favour of expansions, whether vertical or horizontal, or in favour of building new structures. Although this is partly connected to difficult financial conditions, issues relating to maintenance and upkeep generally receive little attention in Jordan and the region, even under circumstances where the financial capacity to carry them out exists. Changing this mindset regarding maintenance and upkeep is not an easy task.

It is interesting to note that in spite of tight financial conditions, including a reception room in the house for guests is of extreme importance even though it can easily take up a quarter or more of the total area of the house. This is connected to the issue of "keeping up appearances," but is also an expression of the emphasis on hospitality in Jordan and the region. It also should be noted, however, that these reception rooms often are also used as sleeping areas at night. Moreover, we have noticed that in some newer structures owners are beginning to incorporate smaller reception rooms in comparison to older ones in order to allocate more space to other essential family functions.

Issues relating to aesthetics (or, to put it simply, making the house look nice) do not seem to be a priority at all. Again, this is partly connected to tight financial conditions and to the predominant view that beauty is equated with spending money. It should be noted that the educational system and predominant cultural norms do not place any emphasis on this issue, even though improving the aesthetic qualities of one's surroundings can be carried with limited financial resources and can greatly enhance the concept of the dwelling as a home. There of course are exceptions, as with house 3, which is clad with irregular rough irregularly-shaped stone sheathing to give it a rustic look. Although many may not share the visual tastes of the owner of the house, one cannot but admire the attention to visual impact that he has shown, even though such attention is only provided to parts of the house and its site.

Regarding infrastructure services, the vast majority of villages in Jordan are connected to the electricity grid. Other infrastructure services such as fresh water are also available, but only provided intermittently (we were told that water is pumped to the houses for only seven hours every two weeks. Those who do not have access to water tanks or wells rely on private freshwater suppliers who charge much higher prices in comparison to the authorities. Other services such as sewage networks are not available in most of rural Jordan, so inhabitants rely primarily on cesspits that need to be emptied regularly for sewage management.

Although dwellers obtain official plans and drawings from licensed engineering offices, these documents are solely used for official licensing procedures, and therefore more or less remain ink on paper. The built houses, as a result, often show little correlation to what is indicated in the building drawings. The final outcome is instead dictated by the decisions of the builders and inhabitants as well as by financial constraints.

Municipal regulations in fact do not seem to be much of an issue of concern in such communities. As mentioned above, these communities are characterized by tight social fabrics, and many of the inhabitants are connected through family ties. This social fabric extends to include municipal institutions since the residents usually have relatives working there. Still, it is also clear that existing regulations, which are highly-centralized and are imposed by the renamed Ministry of Local Administration, do not at all allow for any variations that would accommodate local specificities.

Finally, as mentioned above, it is worth noting that we have come across cases where adjacent houses share a staircase to reach the upper level of the houses. This sharing of resources, which results in a more efficient and cost-effective use of them, may be expanded. For example, it is worth exploring the degree to which other building components such as water wells and cesspits may be shared by adjacent residences. Issues relating to the fair use of these resources by their co-owners of course will need to be studied more carefully, but such issues do not post insurmountable challenges.

Possible forward scenarios:

Breaking with prevalent social habits and behavioural patterns is not easily achievable. Still, minor changes affecting design and construction can bring about major impacts, and once a turning point is achieved, the changes will take root. Such changes of course will not take place in isolation of existing social, cultural, and economic contexts. These may include issues such as the emphasis on privacy, the celebration of hospitality, and making the best out of limited resources.

A design exercise in which a typical planning layout for an 85-square-meter house is extensively rethought needs to be carried out. In doing so, issues relating to the efficiency of movement and space utilization, and even of plumbing layouts need to be considered. In addition, an emphasis on incorporating passive thermal control principles need to be explored. Moreover, issues relating to the importance of the apparently contradictory needs of privacy and hospitality need to be addressed. As one does so, existing architecture / engineering offices that provide the drawings to be licensed by municipalities should be brought on board.

In terms of construction materials and techniques, one needs to make the best use out of what exists and to also explore other cost-effective, durable, and easy to implement options. Clearly, such materials and construction techniques need to address water and thermal insulation far more effectively than what is currently used. A retraining of contractors needs to be carried out since the construction standards they are currently following can be greatly improved upon.

A model house could be developed out of this process. It may also be implemented in association with Habitat Jordan. Of course, no single model house will be suitable for all conditions. Accordingly, it would be worthwhile to develop general guidelines that address design as well as construction materials and techniques. These guidelines also may tackle issues of aesthetics, emphasizing their positive emotional and psychological impacts. Moreover, such a model house should only be viewed as an initial prototype and will need to be further developed and tweaked based on the feedback of users, as well as a continuous evaluation of issues such as the effectiveness of existing thermal and water insulations systems used.

And of course, discussions with the different stakeholders, whether users, contractors, municipal officials, or architecture / engineering offices regarding what may be accomplished will need to be carried out. They may present useful ideas, but they also may express resistance to change. Accordingly, developing approaches for engaging with and absorbing such resistance will need to be considered.