

The Gaza Settlement Houses

This note summarizes the status of the existing Gaza settlement houses and examines issues related to the removal of hazardous materials, partial demolition, reuse of the material for future building and road construction, and the disposal of unusable rubble.

A. Number of Houses and Material to be Removed

1. There are some 236 public and 2,528 residential buildings that fall within the settlement areas of Gaza¹. This note is premised on the assumption that the announcement by Secretary Rice that all the housing units will be destroyed still stands.
2. GOI estimates that the residential buildings in the settlements will comprise an estimated 820,000m³ in compacted material², equivalent to some 1.2 million m³ of transportable material. It would require some 61,620 truck-load equivalents to remove this quantity of material (assuming large trucks with a capacity of 20 m³ and capable of carrying a 40 ton load). Based on a visit to three settlements, a Bank consultant believes these estimates are reasonable, if slightly on the generous side (i.e. the amount of material is probably somewhat less). These estimates will be confirmed following the completion of a GOI “demolition audit” underway and expected to be complete by the end of this week³.

B. Environmental Issues and the Removal of Hazardous Materials

3. Should the houses be demolished without removing any hazardous material, this material will contaminate all of the rubble and will render it unusable; it is also likely to harm the environment. The rubble would then have to be disposed of in an environmentally safe manner. Given the quantities of rubble involved, this would be a daunting task (the rubble could not, for example, be dumped in the sea). GOI has indicated repeatedly that it will take no action that would in any way cause environmental damage. Thus if the intention is to reuse or dispose of the rubble easily and safely, **it is essential that any hazardous material be removed before demolition starts.** GOI has commissioned an environmental audit of the houses to investigate the precise nature and quantity of hazardous materials used in house construction. Tenders were opened on 17 July, and a contract was awarded on 21 July. Work started today, and preliminary results should be available around 2-4

¹ Agricultural buildings and military structures are not included in these data. The World Bank has been informed that all military installations will be demolished and removed, as will sensitive buildings such as synagogues.

² Without a very detailed audit, it is not possible to estimate the amount of material from public structures because public buildings vary substantially in terms of their construction. Besides, no decision has been made on whether or not to demolish public buildings.

³ The audit will provide estimates of the cost of demolition and removal of rubble. In so doing, it will provide a more accurate estimate of the quantities of the various materials.

August. That said, inspections of the buildings, including by a Bank consultant, indicate that the amount of hazardous material is relatively small.

4. The predominant building material is concrete (concrete bricks and reinforced concrete). However, GOI estimate that 320 buildings contain some asbestos (mainly in the roofs). In addition to the asbestos, fuel, gas tanks, disconnected transformers etc, need to be removed **before** demolition starts. This can be done quickly once the houses are empty (and while the IDF is still present to protect the process of demolition and disposal of synagogues and military structures). It is estimated that it would take about 2 days per house to remove asbestos roofs. Other materials can be removed very rapidly (though underground gas tanks, if any, would take longer). In total, all hazardous materials could probably be removed within 2 weeks if, as GOI intends, some 30 specialist groups are recruited to do so. Removal of asbestos would need to be done by a firm or firms with experience in this field (workers need proper protective clothing and certain procedures need to be followed). It is recommended that a contract or contracts for removal of this material be drawn up and let as soon as possible. **It is assumed that hazardous materials would be removed from Gaza by Israel for safe disposal.**

C. Demolition of the Houses

5. Assuming that the GOI decision to demolish the houses stands, there are two options for demolition by GOI once the hazardous material has been removed.

- **Complete demolition** which leaves nothing standing, or
- **Light demolition**, i.e. the minimum demolition possible to render the buildings uninhabitable and virtually impossible to reconstruct.

6. The latter approach would allow much more building material to be reused (for example, doors, window frames, some bathroom and kitchen fittings, electrical fittings, etc). It can be accomplished by knocking down one wall with an excavator shovel, or taking off the whole roof with a grab-dredger. A disadvantage of lighter demolition is that the partially destroyed buildings would represent a possible danger to those working on the future deconstruction process.

7. The issue of the extent to demolition should be discussed and agreed between GOI and the PA. Once the demolition process has been completed by GOI, responsibility would shift to the PA. Based on statements by GOI, **it is assumed that GOI would pay the contractors for this deconstruction work including shredding** (see below).

D. Removal of Immediately Reusable Material

8. After the settlements are taken over by the PA (and the houses adequately protected), workers could be organized to remove and sort as much of the material as possible. If light demolition has been pursued, it is estimated that it would take about 12 man-days per house (of unskilled labor) to remove and sort materials. If so, this will provide about 200 man-years of work in total⁴. All materials should be properly

⁴ Assuming 250 days in one man-year of labor.

separated for salvage or for disposal. After emptying the buildings, basically only concrete would remain. In contrast, if complete demolition were used, less material could be salvaged, less employment would be created, and more unusable rubble would remain at the end. Following sorting, bids would be let for the final deconstruction of the empty houses (alternatively, the sorting could be done as part of the deconstruction contract). Reliable estimates of the cost of this work are needed but not yet available.

9. The bulk of the sorted material will consist of **concrete**---reinforced concrete, concrete blocks, concrete floor tiles and plaster. It is estimated that 77 % of all material (or up to 630,000 m³) will be concrete. Including a factor for transport, this would be equivalent to over 47,000 truck loads of material.

10. **We believe that nearly all the concrete rubble can be reused (provided it is not mixed with any hazardous waste material).** If there has been light demolition, much will consist of unbroken concrete blocks which can be reused “as-is” for building. Damaged concrete blocks and reinforced concrete can be shredded and used for future building and road construction⁵. Because of the high costs of aggregate in the Gaza strip (about US\$10 per ton), shredded concrete would be a valuable resource to the construction industry. Under light demolition, perhaps two thirds of the concrete blocks could be reused. Depending on the size and number of machines, it would take between 3 and 8 months to shred all 630,000 m³⁶. If the demolition of the buildings is not done carefully, fewer concrete blocks will be available for reuse and more would have to be shredded (shredders could, once this work is finished, be used to assist in the processing of materials from buildings in Gaza that have been demolished in the course of the conflict).

11. The rest of the material, some 20-25% or some 190,000 m³, consists of ferrous and non-ferrous metals, timber, plywood, gypsum with paper backing, polystyrene, etc. With light demolition, **most of this remaining material can also be reused**; it can be sold, given away, or processed for future use. The PA will need to decide how this material is to be made available to the public. Much of this would be destroyed in a complete demolition, resulting in additional unusable rubble.

E. Unusable Rubble

12. During the deconstruction process, some waste will emerge which will have to be disposed of in a suitable/special landfill---such items as broken wood, plastic, concrete from flat roofs polluted with tar/bitumen (used as sealants), or concrete from garages and repair shops polluted with gas, fuel, and heavy oil. If there is only a *small* amount of this kind of concrete, or if it is only slightly polluted, it can also be shredded and mixed with the other shredded concrete in accordance with sound environmental practice. If not, it will have to be extracted and removed. It is estimated

⁵ A portable shredding machine can process 800 – 900 tons of solid concrete per day; a large machine up to 2,000 tons per day (1m³ = 2 tons concrete).

⁶ With 630,000 m³ of concrete, and an assumption that only one third would need to be shredded, this would mean that some 210,000 m³ of material would require shredding (equivalent to 420,000 tons). With one large machine processing 2,000 tons per day, this would take about 210 days. With more machines, the time needed would be reduced.

that in addition to the hazardous material removed at the start of the process, perhaps 30% of the non-concrete material may not be suitable for reuse after a light demolition. This would amount to 57,000 m³ or 4,200 truck load equivalents---a far cry from the 61,200 total truckloads of rubble if not reused. A complete demolition would result in much more unusable rubble, perhaps some 12, 000 truck load equivalents. **Israel and the PA will need to agree on where this non-toxic but unusable material will be disposed.**

F. Management of and Payment for the Process

13. If agreement is reached by the Parties along the lines suggested above, the Palestinians would be left with a valuable asset suitable for further building and road construction. Agreement or confirmation will be needed on a number of issues:

- The removal and disposal of environmentally hazardous materials by GOI
- The level of demolition – light or complete
- GOI's willingness to pay for the deconstruction of the houses
- Where the end-result non-toxic but unusable rubble will be disposed of, be it in Gaza, Israel or a third country
- How to ensure that agreements are implemented and deconstruction completed as agreed, i.e. the future management of the process, and
- The form of contract to be let for the deconstruction and shredding of material.

14. GOI could pay the PA upfront for work to be done (deconstruction and shredding), or could instead pay a third party which would, with PA concurrence, ensure that contracts are let in accordance with international best practice and make payments against monitorable performance targets by the ultimate contractor. This role could be played by an international organization or an internationally recognized procurement/consulting agency (or some combination of both). GOI is going to want some guarantee that the job will be completed as agreed between the parties.

15. Decisions are also needed on whether to purchase (or ask donors to provide) shredders for use by the contractors, or, as is normal practice, to expect the contractors to include the purchase cost of shredders in their bid price, thereby allowing them to purchase shredders of their choice.

Summary of Recommendations and Issues that Need to be Negotiated by the Parties

Issue	GOI	PA
1. Disposal of hazardous material by GOI	Israel has the technical skills to remove and dispose of this hazardous material based on the ongoing environmental audit. The amount of debris requiring special landfill is small.	Later demolition and deconstruction can be carried out without any risk. No contamination of rubble, which can therefore be reused
2 (a) "Light" demolition by GOI	GOI Cabinet decision fully implemented	Most of the materials would not be damaged and could be reused once full demolition is carried out
2 (b) "Complete" demolition	GOI Cabinet decision fully implemented	More materials damaged, less available for reuse and more unusable rubble at the end
3. Emptying of buildings and separation of materials by Palestinians (paid for by GOI)	Lower labor costs than for Israeli workers	Provision of employment using unskilled labor, material can be sorted for further reuse or removal
4. Deconstruction process by Palestinians (paid for by GOI)	Hazardous material is not mixed with "normal" debris	Contracts to be awarded following a competitive process
5. Salvage of material	The amount of debris to be disposed of is small	Most sorted materials can be reused for building purposes in Gaza, particularly following a "light" demolition; has significant economic value
6. Shredding of concrete by Palestinians	No costs for disposal of concrete debris. Lessens concerns about trucks crossing border (though unusable rubble still an issue)	Shredding machines could be used after this work for other houses that have been demolished; cheap provision of construction aggregate
7. Removal and disposal of remaining rubble. Small amount of waste to be disposed of, location to be agreed (including possibility of third country)	Need to agree where this unusable rubble will be disposed of	Need to agree where this unusable rubble will be disposed of
8. Payment and payment mechanism	Supervision of performance and payment by third party?.	Direct payment to PA?