**Table 1. Predicted damage percentage (%), population size, number of affected people, and demand (unit).**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Affected area | Damage percentage | Population size | Number of affected people | Demand of canned tuna | Demand of canned beans | Demand of drinking water |
| 1 | 24 | 167013 | 40084 | 120252 | 120252 | 240504 |
| 2 | 15 | 513365 | 77005 | 231015 | 231015 | 462030 |
| 3 | 29 | 417950 | 121206 | 363618 | 363618 | 727236 |
| 4 | 28 | 261938 | 73343 | 220029 | 220029 | 440058 |
| 5 | 20 | 175849 | 35170 | 105510 | 105510 | 211020 |
| 6 | 19 | 232616 | 44198 | 132594 | 132594 | 265188 |
| 7 | 10 | 256575 | 25658 | 76974 | 76974 | 153948 |
| 8 | 24 | 89216 | 21412 | 64236 | 64236 | 128472 |
| 9 | 19 | 327061 | 62142 | 186426 | 186426 | 372852 |
| 10 | 23 | 296823 | 68270 | 204810 | 204810 | 409620 |
| 11 | 28 | 200161 | 56046 | 168138 | 168138 | 336276 |
| 12 | 26 | 105263 | 27369 | 82107 | 82107 | 164214 |
| 13 | 26 | 13849 | 3601 | 10803 | 10803 | 21606 |

**Table. 2. Storage capacity (unit), establishment cost (million tomans), and percentage of unusable inventory (%).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Percentage of unusable inventory | | | Establishment cost | Storage capacity | | | Warehouse | | Drinking  water | **Canned beans** | **Canned tuna** | **Drinking water** | **Canned beans** | **Canned tuna** | | 13 | 10 | 10 | 3391.2 | 544000 | 272000 | 272000 | 1 | | 9 | 6 | 6 | 3942.3 | 670000 | 335000 | 335000 | 2 | | 12 | 9 | 9 | 3202.8 | 544000 | 272000 | 272000 | 3 | | 12 | 9 | 9 | 1768.2 | 365000 | 182000 | 182000 | 4 | | 7 | 4 | 4 | 1390.2 | 287000 | 143000 | 143000 | 5 | | 10 | 7 | 7 | 1480.5 | 285000 | 142000 | 142000 | 6 | | 5 | 2 | 2 | 1808.1 | 248000 | 124000 | 124000 | 7 | | 7 | 4 | 4 | 4072.2 | 534000 | 267000 | 267000 | 8 | | 8 | 5 | 5 | 2456.7 | 373000 | 186000 | 186000 | 9 | | 13 | 10 | 10 | 3240 | 468000 | 234000 | 234000 | 10 | | 11 | 8 | 8 | 4680 | 676000 | 338000 | 338000 | 11 | | 14 | 11 | 11 | 2700 | 390000 | 195000 | 195000 | 12 | | 12 | 9 | 9 | 3159 | 608000 | 304000 | 304000 | 13 | |

**Table 3. Contract parameters for every** **supplier–provided quantity interval.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Drinking water | | | Canned beans | | | Canned tuna | | |  |  |
| Interval 3 | **Interval 2** | **Interval 1** | **Interval 3** | **Interval 2** | **Interval 1** | **Interval 3** | **Interval 2** | **Interval 1** |  |  |
| 550000 | 350000 | 0 | 250000 | 180000 | 0 | 210000 | 180000 | 0 | **(unit)** | **Supplier 1** |
| 680000 | 550000 | 350000 | 300000 | 250000 | 180000 | 250000 | 210000 | 180000 | **(unit)** |
| 2000 | 2000 | 2000 | 10200 | 10700 | 11000 | 13200 | 13700 | 14200 | ***pc1* (tomans)** |
| 25 | 25 | 10 | 35 | 35 | 20 | 35 | 35 | 20 | **(%)** |
| 35 | 30 | 25 | 40 | 30 | 20 | 30 | 30 | 30 | **(%)** |
| 75 | 70 | 65 | 73 | 67 | 64 | 75 | 69 | 65 | **(%)** |
| 70 | 65 | 60 | 65 | 60 | 60 | 68 | 63 | 60 | **(%)** |
| [60,15,25] | [75,15,10] | 100 | [60,40] | [70,30] | [85, 15] | [65,35] | [80,20] | 100 | **(%)** |
| [35,45,60] | [0,35,45] | 0 | [30,45] | [0,35] | [0,35] | [45,60] | [35,45] | 0 | **(day)** |
| 650000 | 450000 | 0 | 260000 | 200000 | 0 | 240000 | 200000 | 0 | **(unit)** | **Supplier 2** |
| 800000 | 650000 | 450000 | 320000 | 260000 | 200000 | 270000 | 240000 | 200000 | **(unit)** |
| 1700 | 2000 | 2200 | 10800 | 11300 | 11300 | 13500 | 14500 | 14500 | ***pc1* (tomans)** |
| 35 | 25 | 12 | 27 | 20 | 14 | 28 | 20 | 15 | **(%)** |
| 40 | 40 | 30 | 35 | 25 | 20 | 35 | 35 | 25 | **(%)** |
| 71 | 68 | 68 | 75 | 71 | 68 | 74 | 69 | 65 | **(%)** |
| 65 | 65 | 65 | 70 | 68 | 65 | 65 | 65 | 60 | **(%)** |
| [60,20,20] | [70, 15, 15] | [70,15,15] | [60,40] | [70,30] | [80,20] | [70,30] | 100 | 100 | **(%)** |
| [25,40,60] | [20,30,45] | [0,20,35] | [35,60] | [30,50] | [0,30] | [35,55] | 35 | 0 | **(day)** |
| 700000 | 600000 | 0 | 280000 | 200000 | 0 | 250000 | 170000 | 0 | **(unit)** | **Supplier 3** |
| 800000 | 700000 | 600000 | 340000 | 280000 | 200000 | 290000 | 250000 | 170000 | **(unit)** |
| 1900 | 2300 | 2500 | 11000 | 11500 | 12000 | 14200 | 14200 | 14900 | ***pc1* (tomans)** |
| 40 | 40 | 30 | 38 | 15 | 12 | 35 | 35 | 35 | **(%)** |
| 50 | 40 | 30 | 50 | 35 | 25 | 40 | 30 | 30 | **(%)** |
| 77 | 77 | 72 | 75 | 70 | 65 | 77 | 70 | 70 | **(%)** |
| 71 | 71 | 66 | 70 | 65 | 60 | 70 | 65 | 65 | **(%)** |
| [60,25,15] | 100 | 100 | [60,20,20] | [70,30] | [80,10,10] | [75,25] | 100 | 100 | **(%)** |
| [25,35,45] | 0 | 0 | [35,45,55] | [25,40] | [0,20,35] | [45,60] | 40 | 30 | **(day)** |
| 500000 | 400000 | 0 | 300000 | 250000 | 0 | 260000 | 210000 | 0 | **(unit)** | **Supplier 4** |
| 600000 | 500000 | 400000 | 350000 | 300000 | 250000 | 300000 | 260000 | 210000 | **(unit)** |
| 1600 | 1600 | 1900 | 11700 | 11700 | 11700 | 13800 | 14800 | 15300 | ***pc1* (tomans)** |
| 20 | 20 | 20 | 40 | 40 | 40 | 40 | 32 | 23 | **(%)** |
| 30 | 25 | 20 | 50 | 40 | 30 | 50 | 35 | 25 | **(%)** |
| 70 | 70 | 65 | 78 | 72 | 66 | 76 | 76 | 68 | **(%)** |
| 65 | 65 | 60 | 72 | 67 | 62 | 70 | 70 | 60 | **(%)** |
| [75,25] | 100 | 100 | [65,35] | [80,20] | [85,15] | [60,40] | [70,20,10] | 100 | **(%)** |
| [25,45] | 25 | 0 | [35,45] | [20,35] | [0,25] | [35,50] | [20,30,40] | 20 | **(day)** |
| 650000 | 550000 | 0 | 280000 | 200000 | 0 | 270000 | 220000 | 0 | **(unit)** | **Supplier 5** |
| 730000 | 650000 | 550000 | 350000 | 280000 | 200000 | 300000 | 270000 | 220000 | **(unit)** |
| 1700 | 2000 | 2000 | 10000 | 10500 | 11000 | 15300 | 15300 | 15300 | ***pc1* (tomans)** |
| 35 | 24 | 10 | 40 | 32 | 27 | 40 | 30 | 25 | **(%)** |
| 40 | 20 | 20 | 40 | 40 | 30 | 50 | 40 | 30 | **(%)** |
| 74 | 70 | 66 | 72 | 69 | 66 | 78 | 73 | 69 | **(%)** |
| 70 | 66 | 62 | 69 | 66 | 63 | 73 | 68 | 64 | **(%)** |
| [65,35] | 100 | 100 | [50,50] | [60,15,25] | [60,15,25] | [75,25] | [70,15,15] | 100 | **(%)** |
| [35,60] | 40 | 30 | [45,60] | [25,35,45] | [15,25,35] | [50,60] | [20,35,50] | 20 | **(day)** |

**Table. 4.** **Budgets for the establishment and procurement of relief supplies** )**million tomans(.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Period 6 | Period 5 | Period 4 | Period 3 | Period 2 | Period 1 |  |
| 6500 | 6500 | 5000 | 5000 | 4000 | 4000 | **Establishment budget** |
| 21500 | 18500 | 14500 | 11500 | 9500 | 7500 | **Procurement budget** |

**Table 5. Coefficient of disruption in transport route, and normal and post–** **earthquake travel time (in minutes) between suppliers of drinking water and centers of affected areas.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Affected area  Supplier | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1 | Disruption coefficient | 3 | 2.5 | 3.2 | 3.3 | 3.1 | 3 | 2.9 | 3.2 | 3.5 | 3.2 | 3.6 | 3.1 | 3.5 |
| Normal time | 67 | 74 | 68 | 65 | 67 | 59 | 76 | 66 | 79 | 79 | 76 | 79 | 77 |
| Post–earthquake time | 201 | 185 | 218 | 215 | 208 | 177 | 221 | 212 | 277 | 253 | 274 | 245 | 270 |
| 2 | Disruption coefficient | 3.7 | 3.1 | 3.3 | 3.3 | 3.2 | 3.1 | 3.3 | 3.7 | 3.6 | 3.4 | 3.7 | 3 | 3.6 |
| Normal time | 35 | 44 | 34 | 43 | 43 | 40 | 44 | 41 | 38 | 22 | 28 | 30 | 39 |
| Post–earthquake time | 130 | 137 | 113 | 142 | 138 | 124 | 146 | 152 | 137 | 75 | 104 | 90 | 141 |
| 3 | Disruption coefficient | 3.7 | 3.1 | 3.3 | 3.3 | 3.2 | 3.1 | 3.3 | 3.7 | 3.6 | 3.4 | 3.7 | 3 | 3.6 |
| Normal time | 30 | 42 | 32 | 41 | 41 | 37 | 43 | 38 | 35 | 21 | 30 | 18 | 36 |
| Post–earthquake time | 111 | 131 | 106 | 136 | 132 | 115 | 142 | 141 | 126 | 72 | 111 | 54 | 130 |
| 4 | Disruption coefficient | 3.7 | 3.1 | 3.3 | 3.3 | 3.2 | 3.1 | 3.3 | 3.7 | 3.6 | 3.4 | 3.7 | 3 | 3.6 |
| Normal time | 64 | 65 | 57 | 68 | 65 | 59 | 66 | 63 | 61 | 54 | 61 | 50 | 63 |
| Post–earthquake time | 237 | 202 | 189 | 225 | 208 | 183 | 218 | 234 | 220 | 184 | 226 | 150 | 227 |
| 5 | Disruption coefficient | 3 | 2.5 | 3.2 | 3.3 | 3.1 | 3 | 2.9 | 3.2 | 3.5 | 3.2 | 3.6 | 3.1 | 3.5 |
| Normal time | 66 | 59 | 53 | 62 | 62 | 53 | 61 | 59 | 51 | 44 | 51 | 35 | 58 |
| Post–earthquake time | 198 | 148 | 170 | 205 | 193 | 159 | 177 | 189 | 179 | 141 | 184 | 109 | 203 |

**Table 6. Coefficient of disruption in transport route, and normal and post–** **earthquake travel time (in minutes) between suppliers of conserves and centers of affected areas.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Affected area  Supplier | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1 | Disruption coefficient | 3.7 | 3.1 | 3.3 | 3.3 | 3.2 | 3.1 | 3.3 | 3.7 | 3.6 | 3.4 | 3.7 | 3 | 3.6 |
| Normal time | 43 | 51 | 44 | 61 | 53 | 54 | 56 | 48 | 50 | 31 | 39 | 27 | 54 |
| Post–earthquake time | 160 | 159 | 146 | 202 | 170 | 168 | 185 | 178 | 180 | 106 | 145 | 81 | 195 |
| 2 | Disruption coefficient | 3.7 | 3.1 | 3.3 | 3.3 | 3.2 | 3.1 | 3.3 | 3.7 | 3.6 | 3.4 | 3.7 | 3 | 3.6 |
| Normal time | 36 | 46 | 32 | 42 | 42 | 41 | 42 | 41 | 36 | 20 | 28 | 27 | 41 |
| Post–earthquake time | 134 | 143 | 106 | 139 | 135 | 128 | 139 | 152 | 130 | 68 | 104 | 81 | 148 |
| 3 | Disruption coefficient | 3.7 | 3.1 | 3.3 | 3.3 | 3.2 | 3.1 | 3.3 | 3.7 | 3.6 | 3.4 | 3.7 | 3 | 3.6 |
| Normal time | 38 | 47 | 34 | 44 | 44 | 43 | 45 | 43 | 38 | 22 | 29 | 29 | 45 |
| Post–earthquake time | 141 | 146 | 113 | 146 | 141 | 134 | 149 | 160 | 137 | 75 | 108 | 87 | 162 |
| 4 | Disruption coefficient | 3.5 | 3 | 3.3 | 3.3 | 3.5 | 3.5 | 2.9 | 3.6 | 3.4 | 3.9 | 4 | 3.7 | 3.9 |
| Normal time | 11 | 30 | 40 | 34 | 32 | 26 | 32 | 25 | 36 | 26 | 27 | 43 | 26 |
| Post–earthquake time | 39 | 90 | 132 | 113 | 112 | 91 | 93 | 90 | 123 | 102 | 108 | 160 | 102 |
| 5 | Disruption coefficient | 3.2 | 3.1 | 3.3 | 3.1 | 2.6 | 2.7 | 2.3 | 3.5 | 3.4 | 3.2 | 3.4 | 3.2 | 3.5 |
| Normal time | 36 | 19 | 16 | 4 | 7 | 22 | 24 | 28 | 49 | 33 | 52 | 46 | 24 |
| Post–earthquake time | 116 | 59 | 53 | 13 | 19 | 60 | 56 | 98 | 167 | 106 | 177 | 148 | 84 |

**Table7. Coefficient of disruption in transport route, and normal and post–** **earthquake travel time (in minutes) between warehouses and centers of affected areas.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Affected area  Warehouse | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1 | Disruption coefficient | 3.5 | 3 | 3.3 | 3.4 | 3.5 | 3.5 | 2.9 | 3.6 | 3.4 | 3.9 | 4 | 3.7 | 3.9 |
| Normal time | 1 | 17 | 20 | 23 | 23 | 13 | 20 | 11 | 18 | 17 | 17 | 25 | 13 |
| Post–earthquake time | 4 | 51 | 66 | 79 | 81 | 46 | 58 | 40 | 62 | 67 | 68 | 93 | 51 |
| 2 | Disruption coefficient | 3.3 | 2.5 | 3.2 | 3.3 | 3.1 | 3.1 | 2.8 | 3.2 | 3.5 | 3.2 | 3.6 | 3.1 | 3.4 |
| Normal time | 24 | 34 | 26 | 34 | 34 | 30 | 35 | 31 | 27 | 17 | 23 | 17 | 30 |
| Post–earthquake time | 80 | 85 | 84 | 113 | 106 | 93 | 98 | 100 | 95 | 55 | 83 | 53 | 102 |
| 3 | Disruption coefficient | 3.3 | 3.2 | 3.8 | 3.7 | 3.3 | 3.2 | 2.9 | 3.9 | 3.3 | 3.4 | 3.6 | 3.3 | 4.1 |
| Normal time | 31 | 28 | 17 | 29 | 34 | 24 | 38 | 34 | 41 | 28 | 41 | 57 | 30 |
| Post–earthquake time | 103 | 90 | 65 | 108 | 113 | 77 | 111 | 133 | 136 | 96 | 148 | 189 | 123 |
| 4 | Disruption coefficient | 3.4 | 3.3 | 3.7 | 3.5 | 3.1 | 3 | 2.6 | 3.8 | 3.3 | 3.4 | 3.4 | 3.4 | 3.9 |
| Normal time | 34 | 26 | 16 | 5 | 10 | 23 | 22 | 31 | 36 | 23 | 41 | 34 | 23 |
| Post–earthquake time | 116 | 86 | 60 | 18 | 31 | 69 | 58 | 118 | 119 | 79 | 140 | 116 | 90 |
| 5 | Disruption coefficient | 3.5 | 3.1 | 3.3 | 3.1 | 2.6 | 2.7 | 2.3 | 2.6 | 3.5 | 3.3 | 3.7 | 3.4 | 3.2 |
| Normal time | 36 | 30 | 28 | 39 | 40 | 38 | 55 | 39 | 29 | 18 | 22 | 25 | 36 |
| Post–earthquake time | 126 | 93 | 93 | 121 | 104 | 103 | 127 | 102 | 102 | 60 | 82 | 85 | 116 |
| 6 | Disruption coefficient | 3.5 | 3.2 | 3.2 | 3 | 2.7 | 2.7 | 2.1 | 2.6 | 2.9 | 3.2 | 3.6 | 3.4 | 3.2 |
| Normal time | 32 | 17 | 28 | 10 | 10 | 22 | 10 | 19 | 48 | 41 | 29 | 50 | 22 |
| Post–earthquake time | 112 | 55 | 90 | 30 | 27 | 60 | 21 | 50 | 140 | 132 | 105 | 170 | 71 |
| 7 | Disruption coefficient | 2.9 | 3.2 | 2.9 | 2.6 | 2.3 | 2.1 | 1.5 | 2.6 | 2.8 | 3.4 | 3.3 | 3.3 | 2.9 |
| Normal time | 38 | 30 | 39 | 18 | 22 | 35 | 12 | 29 | 36 | 51 | 36 | 43 | 33 |
| Post–earthquake time | 111 | 96 | 114 | 47 | 51 | 74 | 18 | 76 | 101 | 174 | 119 | 142 | 96 |
| 8 | Disruption coefficient | 3.6 | 3.2 | 3.9 | 3.8 | 3.5 | 3.6 | 3.2 | 3.6 | 3.5 | 3.9 | 3.9 | 3.7 | 4 |
| Normal time | 24 | 15 | 28 | 26 | 26 | 13 | 27 | 18 | 40 | 41 | 36 | 49 | 8 |
| Post–earthquake time | 87 | 48 | 110 | 99 | 91 | 47 | 87 | 65 | 140 | 160 | 141 | 182 | 32 |
| 9 | Disruption coefficient | 3.4 | 3.4 | 3.3 | 3.3 | 3.4 | 2.9 | 2.8 | 3.4 | 3.2 | 3.8 | 3.8 | 3.6 | 3.7 |
| Normal time | 39 | 52 | 54 | 41 | 41 | 46 | 44 | 34 | 20 | 22 | 18 | 21 | 45 |
| Post–earthquake time | 133 | 177 | 179 | 136 | 140 | 134 | 124 | 116 | 64 | 84 | 69 | 76 | 167 |
| 10 | Disruption coefficient | 3.3 | 3.2 | 3.4 | 3.4 | 3.3 | 3.4 | 3 | 3.6 | 3.8 | 3.8 | 4.1 | 3.4 | 3.6 |
| Normal time | 28 | 36 | 24 | 37 | 37 | 36 | 38 | 31 | 25 | 6 | 18 | 15 | 32 |
| Post–earthquake time | 93 | 116 | 82 | 126 | 123 | 123 | 114 | 112 | 95 | 23 | 74 | 51 | 116 |
| 11 | Disruption coefficient | 3.5 | 3.5 | 3.6 | 3.6 | 3.4 | 3.8 | 3.1 | 3.5 | 3.8 | 4.1 | 4.4 | 3.8 | 3.7 |
| Normal time | 18 | 32 | 29 | 33 | 34 | 27 | 27 | 22 | 17 | 13 | 12 | 24 | 25 |
| Post–earthquake time | 63 | 112 | 105 | 119 | 116 | 103 | 84 | 77 | 65 | 54 | 53 | 92 | 93 |
| 12 | Disruption coefficient | 3 | 2.8 | 3.1 | 3.2 | 3.1 | 3.1 | 2.9 | 3.2 | 3.4 | 3.4 | 3.8 | 3 | 3.3 |
| Normal time | 45 | 53 | 53 | 54 | 55 | 48 | 60 | 52 | 51 | 31 | 46 | 39 | 50 |
| Post–earthquake time | 135 | 149 | 165 | 173 | 171 | 149 | 174 | 167 | 174 | 106 | 175 | 117 | 165 |
| 13 | Disruption coefficient | 3.9 | 3.6 | 4.1 | 3.9 | 3.5 | 3.5 | 2.9 | 4 | 3.7 | 3.6 | 3.7 | 3.7 | 4.3 |
| Normal time | 17 | 8 | 16 | 17 | 18 | 3 | 22 | 16 | 35 | 31 | 33 | 39 | 5 |
| Post–earthquake time | 67 | 29 | 66 | 67 | 63 | 11 | 64 | 64 | 130 | 112 | 123 | 145 | 22 |