2-2 Basic Plan

2-2-1 Workflow of Basic Plan

In the basic plan, examination required for implementation of this project shall be conducted, such as a present state survey, selection of a bridge construction position, examination of a bridge longitudinal profile plan, setting of a bridge scale, and examination of bridge types in order to decide on an optimal bridge type. The following figure shows the workflow of the basic plan.

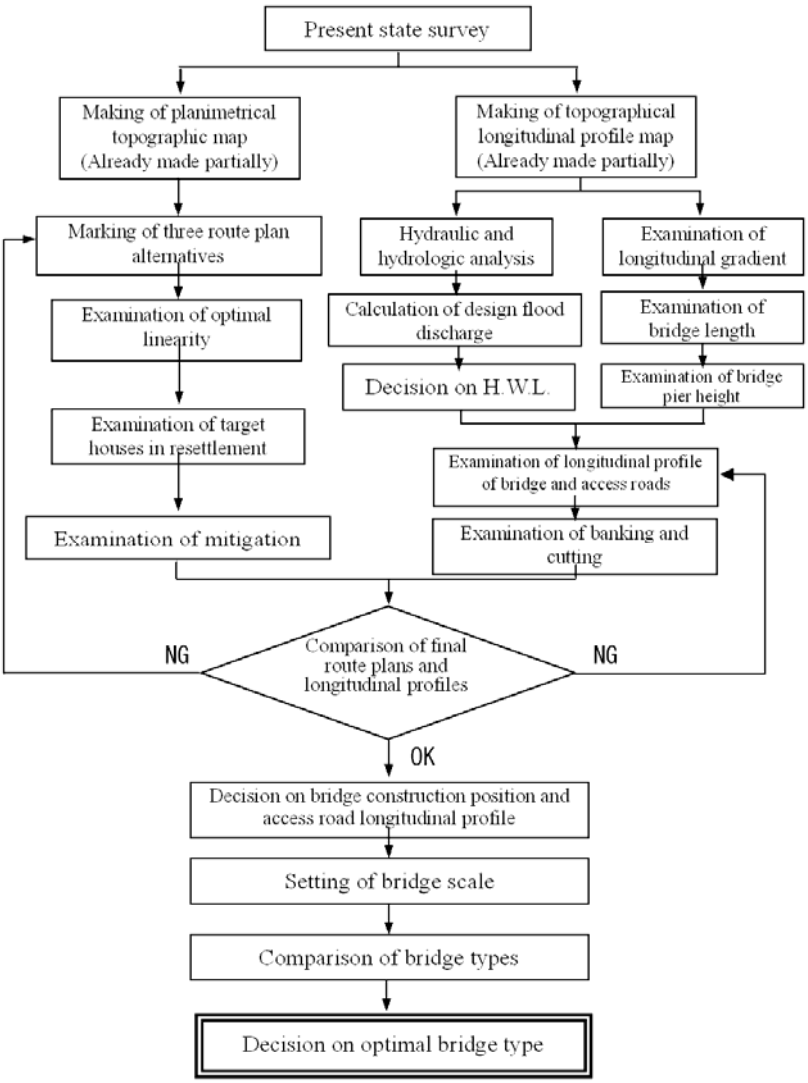


Figure 2-2-1 Basic plan workflow

2-2-2 Status Quo of Bridge Construction Position

The prompt reconstruction of Gogecha and Modjo Bridges on A1 Trunk Road, the most important route in Ethiopia, is requested because they have been significantly deteriorated and damaged.
エラー! 参照元が見つかりません。 and Figure 2-2-3 show the results of present state survey in the vicinity of the existing two bridges.

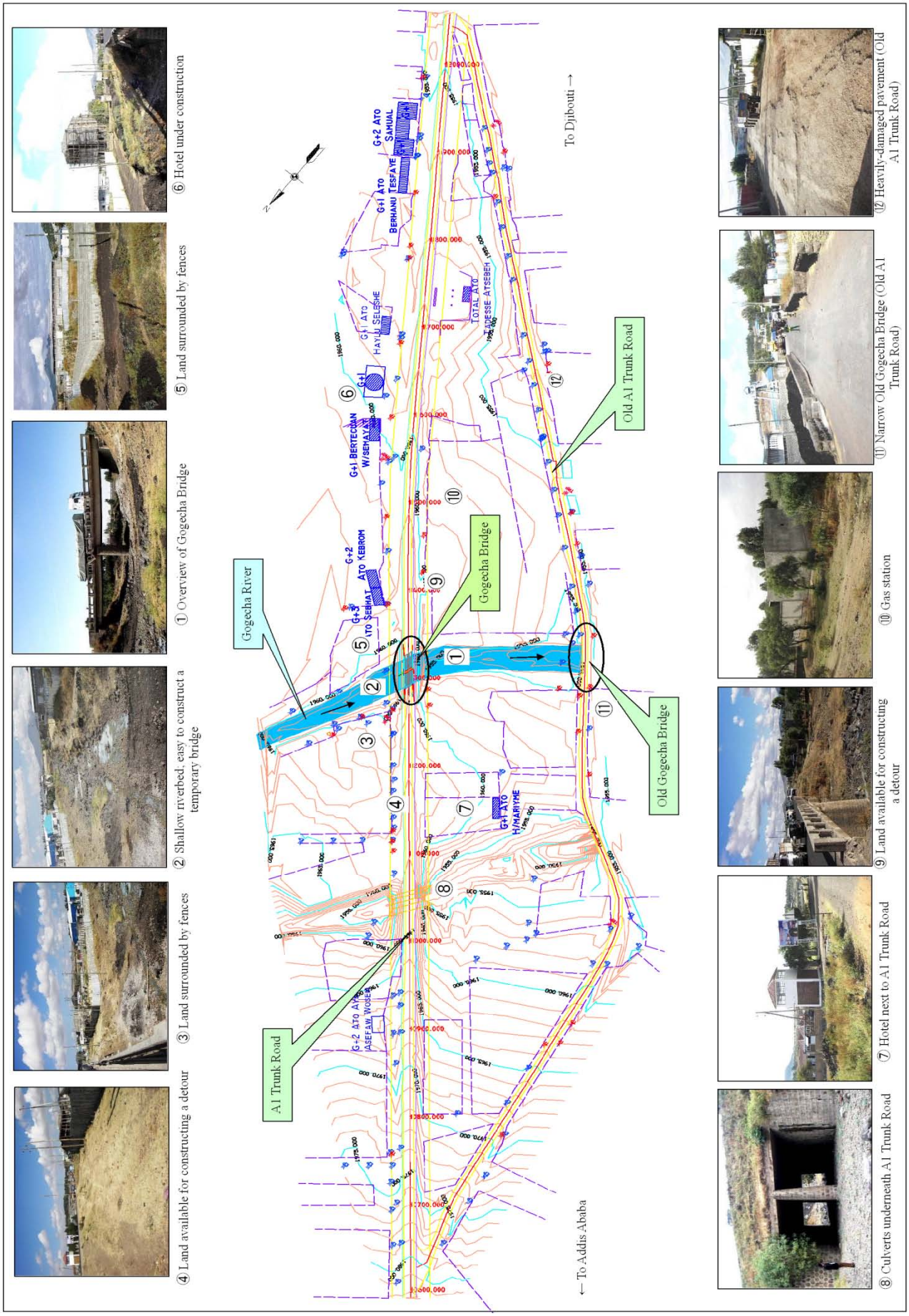


Figure 2-2-2 Map of circumstances around the existing Gogecha Bridge

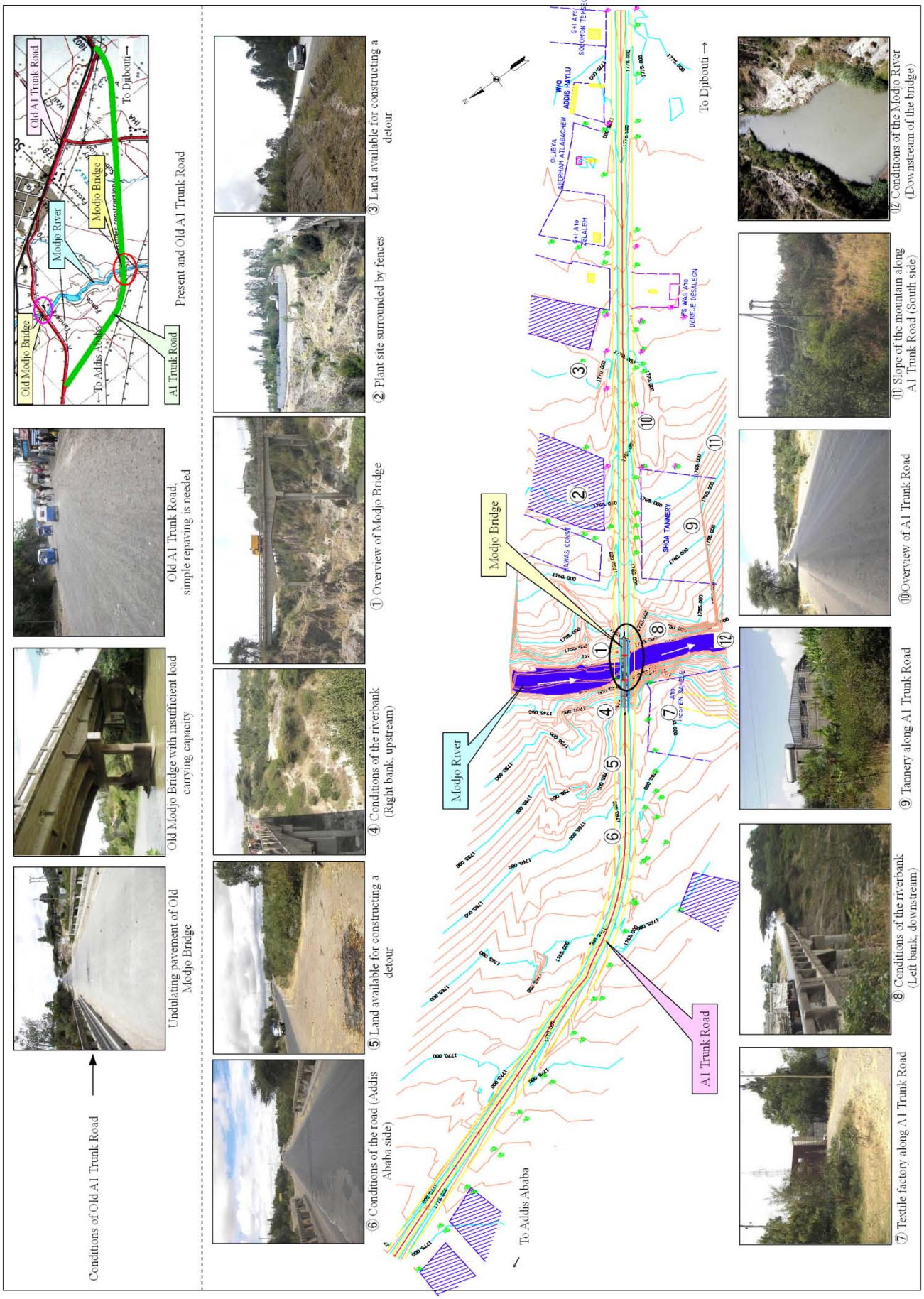


Figure 2-2-3 Map of circumstances around the existing Modjo Bridge

2-2-3 Evaluation and Verification of Existing Bridge

(1) Gogecha Bridge

The existing Gogecha Bridge is a 2-span simple RC-girder bridge built in 1973. This bridge, having been use for about 37 years since opening to traffic, is significantly corroded and damaged, has an insufficient load bearing ability, and faces an exceedingly high risk of falling. Table 2-2-1 and Figure 2-2-4show the results of survey on the health of the existing Gogecha Bridge.

Table 2-2-1 Gogecha Bridge health survey results

<table>
<tr><td colspan="3">Bridge name</td><td colspan="4">Gogecha Bridge</td></tr>
<tr><td rowspan="8">Specifications</td><td colspan="2">Year of construction</td><td colspan="2">1973</td><td>Position</td><td>38°53’38” east longitude, 08°48’09” north latitude</td></tr>
<tr><td colspan="2">Daily average traffic volume</td><td colspan="2">16,099(vehicles per day)</td><td>Altitude</td><td>1,961 m</td></tr>
<tr><td colspan="2">Large vehicle mixing ratio</td><td colspan="2">27 %</td><td>Distance</td><td>35 km from the capital Addis Ababa</td></tr>
<tr><td colspan="2">Width</td><td colspan="4">8.1m (carriageway) + 0.7m (wheel guard) × 2 = 9.5m (total width)</td></tr>
<tr><td colspan="2">Design live load</td><td colspan="4">32 t</td></tr>
<tr><td rowspan="2">Superstructure</td><td>Bridge type</td><td colspan="4">2-span simple RC-girder bridge</td></tr>
<tr><td>Bridge length</td><td colspan="4">19.0+19.0=38.0m</td></tr>
<tr><td colspan="2">Substructure</td><td colspan="2">Bridge abutment: Masonry structure</td><td colspan="2">Bridge pier: Masonry structure</td></tr>
<tr><td rowspan="3">Survey results</td><td colspan="2">Functionality (role) in traffic</td><td colspan="4">・ A1 Trunk Road is the most important route connecting Addis Ababa and Djibouti and has an extremely high functionality (role) in traffic as an international physical distribution route and an intra-region traffic route.
・ With an extremely high daily average traffic volume at 10,920 vehicles per day, the functionality (role) in traffic is extremely high.
・ The lack of sidewalk requires pedestrians to walk in the carriageway, putting them in a dangerous state.</td></tr>
<tr><td colspan="2">Health (Damage level)</td><td colspan="4">・ There are shear cracks in the main girder, being in an exceedingly dangerous state.
・ The floor slab has significant cracks and is superannuated.
・ The bridge abutment and piers are significantly superannuated.
・ The bridge railing is damaged due to a collision of a vehicle.</td></tr>
<tr><td colspan="2">Structural performance (Stability)</td><td colspan="4">・ The main girder is bent even in a no-load state (no vehicle passing) and in a structurally dangerous state.
・ Every time a large vehicle passes, the bridge vibrates significantly, which is a problem in terms of the structure and load bearing ability.</td></tr>
<tr><td colspan="3">Considerations</td><td colspan="4">・ This bridge is in an extremely dangerous state in view of shear cracks in the main girder, bending of the main girder in a no-load state, and vibrations of the bridge when a large vehicle passes.
・ Considering too severe deterioration and deformation in comparison with elapsing of 36 years after construction, there must have been a serious problem in the design and construction (such as design errors and construction defects) at the time of construction.
・ The bridge abutment, piers, and floor slabs are significantly deteriorated and damaged, and has a problem in the load bearing ability.
・ As a result of comprehensive consideration, it is advisable to reconstruct this bridge as early as possible in view of the deterioration/damage and deformation of the bridge itself.</td></tr>
</table>

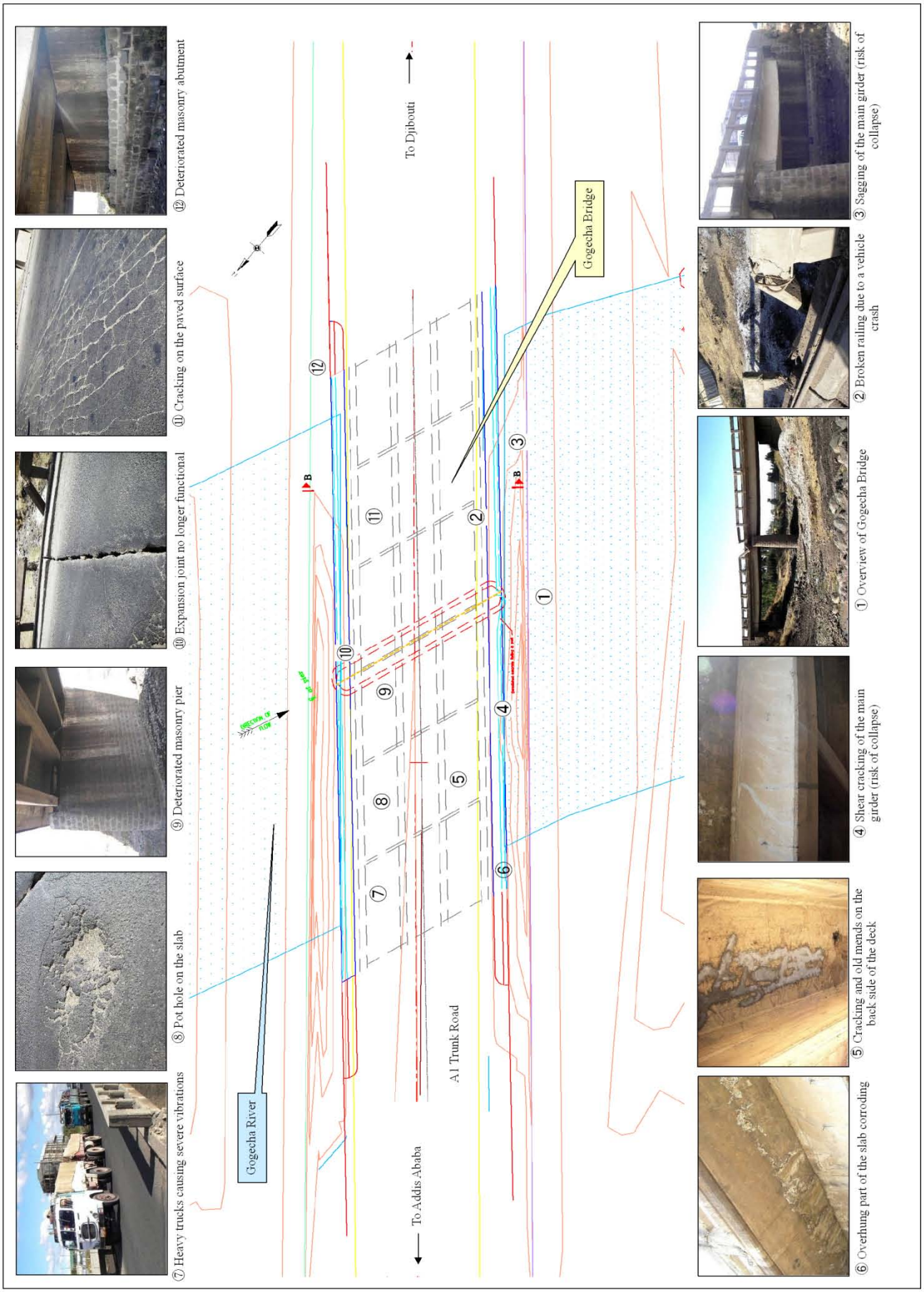


Figure 2-2-4 Existing Gogecha Bridge health survey results

(2) Modjo Bridge

The existing Modjo Bridge is a 3-span continuous RC-girder bridge and a simple RC-girder bridge built in 1972. This bridge, having been use for about 38 years since opening to traffic, is significantly corroded and damaged, has an insufficient load bearing ability, and faces an exceedingly high risk of falling. Table 2-2-2and Figure 2-2-5show the results of survey on the health of the existing Modjo Bridge.

Table 2-2-2 Modjo Bridge health survey results

Bridge name			Modjo Bridge		
Specifications	Year of construction		1972	Position	39°06’40” east longitude, 08°35’50” north latitude
	Daily average traffic volume		9,813 (vehicles per day)	Altitude	1,755 m
	Large vehicle mixing ratio		36 %	Distance	69km from the capital Addis Ababa
	Width		8.0m (carriageway) + 0.8m (wheel guard) × 2 = 9.6m (total width)		
	Design live load		32 t		
	Superstructure	Bridge type	3-span continuous RC-girder bridge + simple RC-girder bridge		
		Bridge length	22.5+31.1+22.5+14.4=90.5m		
	Substructure		Bridge abutment: Masonry structure		Bridge pier: Masonry structure
Survey results	Functionality (role) in traffic		・ A1 Trunk Road is the most important route connecting Addis Ababa and Djibouti and has an extremely high functionality (role) in traffic as an international physical distribution route and an intra-region traffic route. ・ With an extremely high daily average traffic volume at 6,178 vehicles per day, the functionality (role) in traffic is extremely high. ・ The lack of sidewalk requires pedestrians to walk in the carriageway, putting them in a dangerous state.		
	Health (Damage level)		・ There are many large shear cracks in the main girder, being in an exceedingly dangerous state. ・ The floor slab is significantly deteriorated and corroded and is superannuated. ・ The pavement has significant cracks and damages and is superannuated. ・ Many honeycombs made due to construction defects are found. ・ Cracks are found in the PC bridge piers. ・ The masonry bridge abutment is significantly superannuated.		
	Structural performance (Stability)		・ The main girder flange width is so small that it seems to exceed the allowable stress. ・ The bridge piers are so narrow that no consideration seems to have been paid to the seismic design, and there are concerns about safety during earthquakes. ・ Every time a large vehicle passes, the bridge vibrates significantly, which is a problem in terms of the structure and load bearing ability.		
Considerations			・ This bridge is in an extremely dangerous state in view of shear cracks in the main girder and vibrations of the bridge when a large vehicle passes. ・ Considering too severe deterioration and deformation in comparison with elapsing of 36 years after construction, there must have been a serious problem in the design and construction (such as design errors and construction defects) at the time of construction. ・ The bridge abutment, piers, and floor slabs are significantly cracked, deteriorated, and damaged, and has a problem in the load bearing ability. ・ As a result of comprehensive consideration, it is advisable to reconstruct this bridge as early as possible in view of the deterioration/damage and deformation of the bridge itself.		

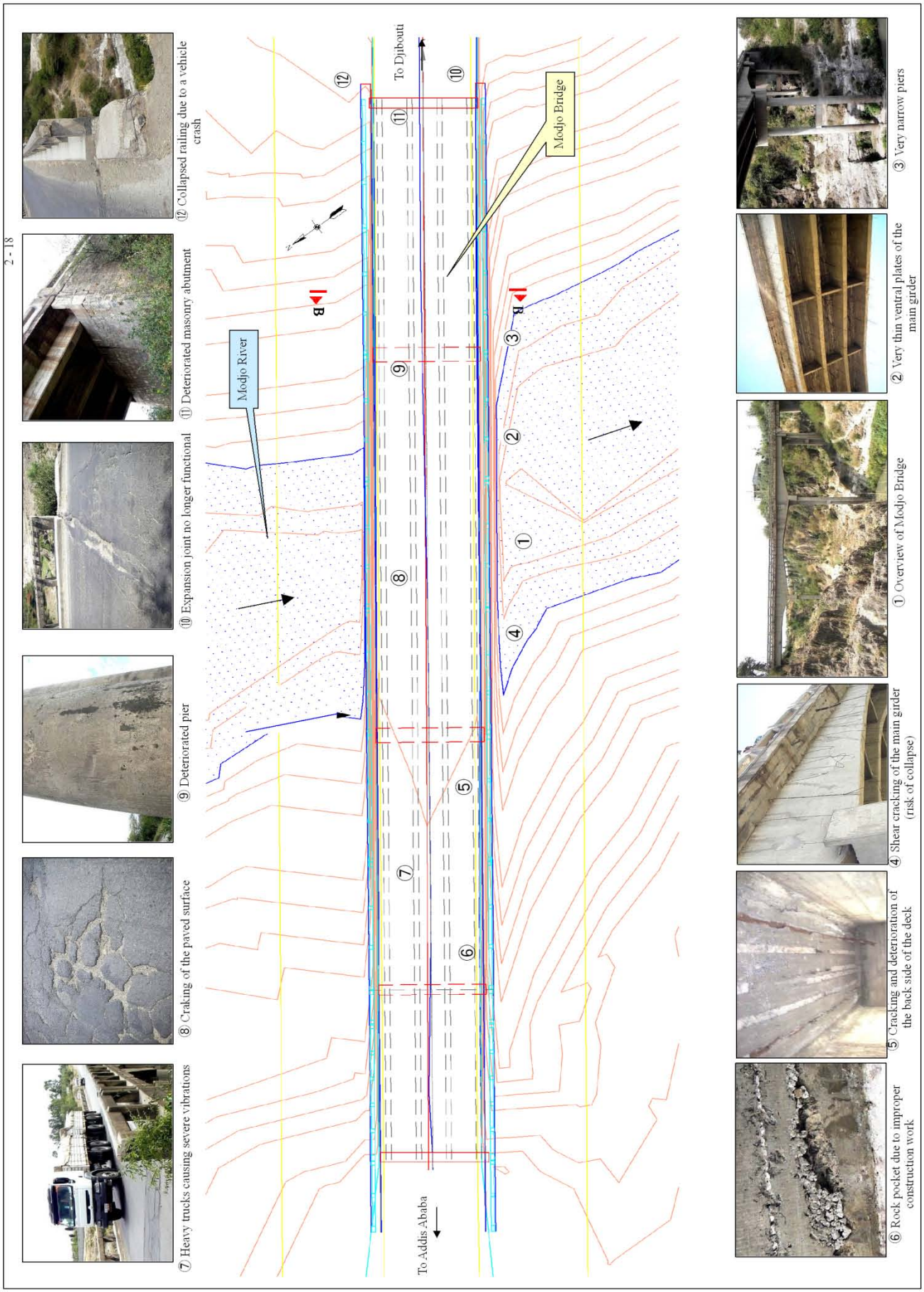


Figure 2-2-5 Existing Modjo Bridge health survey result

2-2-4 Figure Examination of the Bridge Position

(1) Gogecha Bridge

From the result of the comparison among the three alternatives for the position of the Gogecha Bridge, Alternative 1 (shifting the bridge position 50 m upstream from the current position), Alternative 2 (no change from the current position) and Alternative 3 (shifting 50 m downstream from the current position), the survey team selected Alternative 2 as the best alternative for the following reasons. (See Table 2-2-3)

① The current access road is straight on both sides of the bridge. Both in the Alternative 1 (shifting upstream) and Alternative 3 (shifting downstream), shifting the position of the bridge from the current position will require an s-shaped curve in the access road on either side of the bridge. Meanwhile, in the Alternative 2 in which the bridge is to be reconstructed at the current position, the current linearity of the road will be maintained. Therefore, it will have the best road alignment.

② While relocation of residents and land expropriation will be required in the Alternatives 1 and 3, such environmental and social considerations will not be required in the Alternative 2 because the bridge is to be reconstructed at the current position.

③ The Alternative 2 has the highest economic efficiency, because the construction costs of the Alternatives 1 and 3, both of which will require construction of a new bridge over the Burkalego River, will be 1.67 times higher than those of the Alternative 2,

The survey team carried out hydrological and hydraulic surveys and river surveying, as well as boring along the alignment of the road in the Alternative 2.

(2) Modjo Bridge

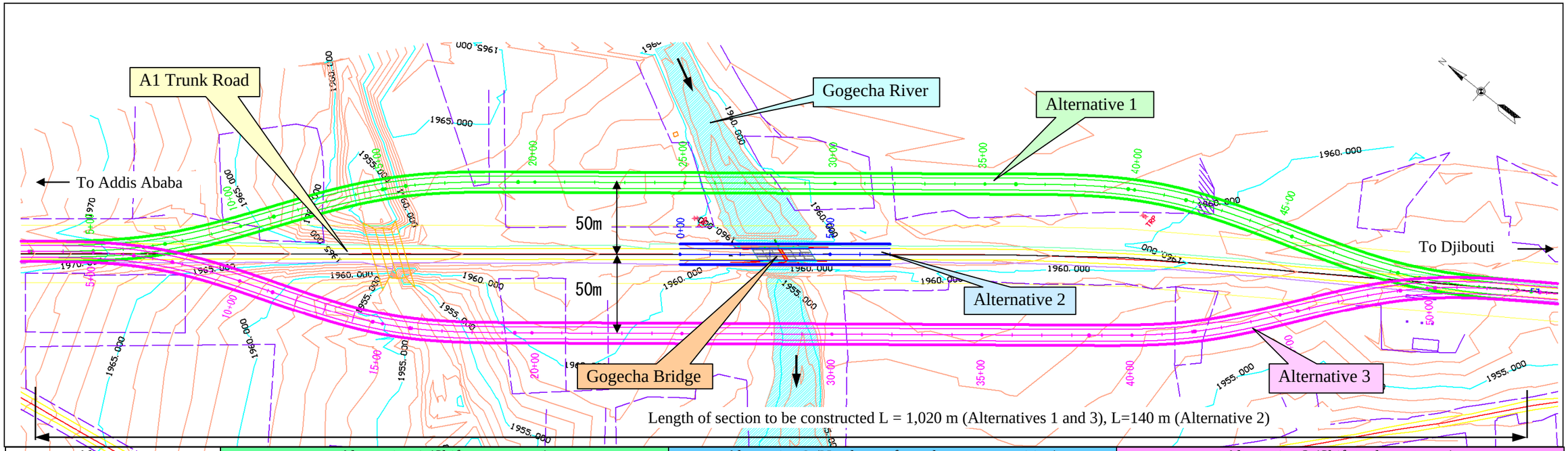
From the result of the comparison among the three alternatives, Alternative 1 (shifting 40 m upstream), Alternative 2 (no change from the current position) and Alternative 3 (shifting 40 m downstream), the survey team concluded that the Alternative 2 (reconstruction of a new bridge at the current position) was the best (Table 2-1 4). However, ERA recommended the Alternative 1 (construction of a new bridge upstream) because it would allow use of the existing bridge at time of emergency. After the survey team explained the result of the comparison between Alternatives 1 and 2 (Table 2-1 5), ERA agreed to select the Alternative 2 as the optimal alternative for the following reasons. (See Tables 2-2-5 and 2-2-6)

① The Alternative 2 has excellent linearity because the linearity of the existing road will be maintained.

② The Alternative 2 is the best alternative in terms of environmental and social considerations because it will not require relocation of the residents or land expropriation.

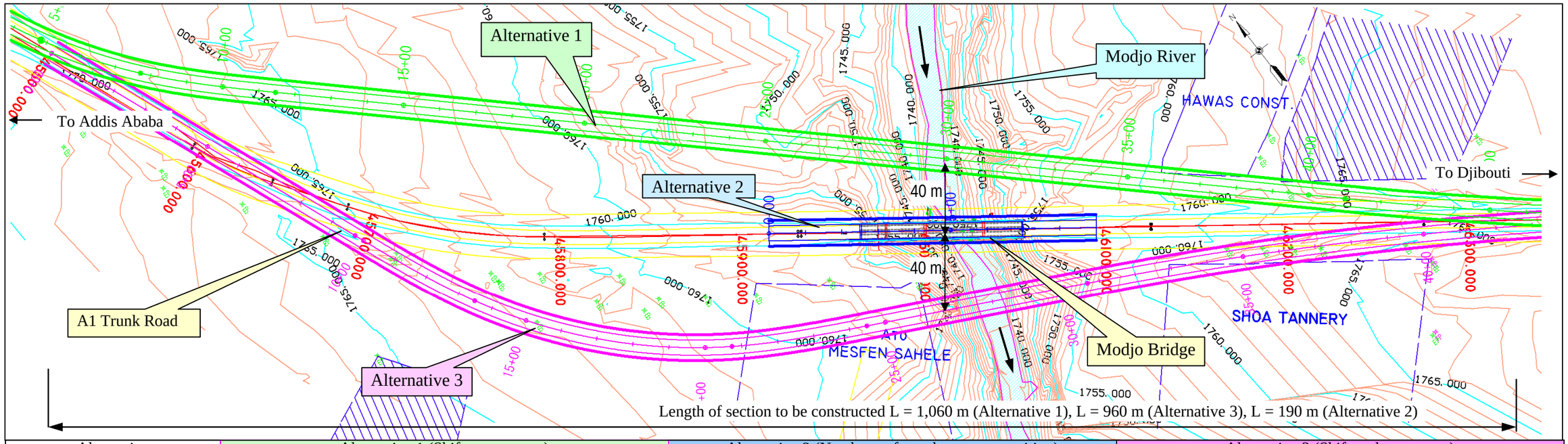
③ While the Alternative 2 will require costs to construct a temporary bridge and a detour and to remove the existing bridge, it will not require costs to construct a new access road. Therefore, it is economically efficient.

Table 2-2-3 Comparison of the bridge position (Gogecha Bridge)



Alternative		Alternative 1 (Shift to upstream)	Alternative 2 (No change from the current position)	Alternative 3 (Shift to downstream)
Outline		・Shift the bridge to 50m upstream from the current position.	・No change from the current position.	・Shift the bridge to 50m downstream from the current position.
Evaluation	Usability of the current bridge	・The current bridge is substantially deteriorated and damaged, lacking load carrying capacity; using the current bridge is not very feasible. ・It is still serviceable for motorbikes, bicycles and pedestrians.	・The current bridge is to be dismantled and removed so that a new bridge can be rebuilt in the same location.	・The current bridge is substantially deteriorated and damaged, lacking load carrying capacity; using the current bridge is not very feasible. ・It is still serviceable for motorbikes, bicycles and pedestrians.
	Linearity of access road	・The current access road is almost straight. If the bridge is reconstructed upstream, the road will include S-shaped curves, which will affect the alignment between the road and the bridge.	・The current access road is almost straight. If a new bridge is reconstructed in the current position, the same, best alignment can be achieved.	・The current access road is almost straight. If the bridge is reconstructed downstream, the road will include S-shaped curves, which will affect the alignment between the road and the bridge.
	Necessity for detours	・The new bridge is to be constructed upstream. The current bridge and access road can be used as they are; no detour is needed.	・As the new bridge is to be rebuilt in the same position, the current bridge and access road cannot be used during the construction; a detour needs to be provided.	・The new bridge is to be constructed downstream. The current bridge and access road can be used as they are; no detour is needed.
	Environmental and social considerations	・There are four (vacant) private land lots surrounded by fences; these premises must be expropriated. ・There is a hotel under construction. It will be competed by the time the reconstruction of the bridge commences; it needs to be dismantled and relocated.	・The new bridge is to be rebuilt in the same position. No relocation of residents or land expropriation is needed.	・There is one quite large hotel in service, which needs to be dismantled and relocated. ・There is a gas station, which needs to be dismantled and relocated. ・The vacant lots surrounding the bridge must be expropriated.
	Workability	・An access road needs to be provided. In the meantime, the current bridge and access road can be used as a detour during the construction.	・The construction of an access road is not needed. On the other hand, a temporary bridge and detour need to be provided.	・An access road needs to be provided. In the meantime, the current bridge and access road can be used as a detour during the construction.
	Construction works to be included (Ratio to the estimated cost)	・Construction of a new bridge, construction of a new access road (Ratio to the estimated cost: 1.04)	・Construction of a new bridge, construction of a temporary bridge and a detour, removal of the current bridge (Ratio to the estimated cost: 1.00)	・Construction of a new bridge, construction of a new access road (Ratio to the estimated cost: 1.04)
	Overall evaluation	・Linearity will be significantly worsened because the access road will have S-shaped curves. ・Environmental and social considerations will pose a serious concern, as this option requires the removal and relocation of buildings as well as the expropriation of land. ・The construction of a new access road requires a considerable cost, resulting in a lower economic efficiency. △	・This is the best solution in terms of linearity, as the current linearity will be maintained. ・This is the best solution in terms of environmental and social considerations, as there is no need for the relocation of residents or land expropriation. ・While the construction of a temporary bridge and a detour and the removal of the current bridge require a certain amount of cost, there is no cost needed for constructing a new access road, resulting in the highest economic efficiency. ○	・Linearity will be significantly worsened because the access road will have S-shaped curves. ・Environmental and social considerations will pose a serious concern, as this option requires the removal and relocation of buildings as well as the expropriation of land. ・The construction of a new access road requires a considerable cost, resulting in a lower economic efficiency. △

Table 2-2-4 Comparison of the bridge position Modjo Bridge)



Alternative		Alternative 1 (Shift to upstream)	Alternative 2 (No change from the current position)	Alternative 3 (Shift to downstream)
Outline		・Shift the bridge to 40m upstream from the current position.	・No change from the current position.	・Shift the bridge to 40m downstream from the current position.
Evaluation	Usability of the current bridge	・The current bridge is substantially deteriorated and damaged, causing severe vibrations when vehicles pass thereon. Also, the strength is not sufficient. Thus, using the current bridge is not very feasible. ・It is still serviceable for motorbikes, bicycles and pedestrians.	・The current bridge is to be dismantled and removed so that a new bridge can be rebuilt in the same location.	・The current bridge is substantially deteriorated and damaged, lacking load carrying capacity; using the current bridge is not very feasible. ・It is still serviceable for motorbikes, bicycles and pedestrians.
	Linearity of access roads	・The current access road is straight at both ends of the bridge. If the new bridge is constructed upstream, the road will include curves at the connecting points, which will affect the alignment between the road and the bridge.	・The current access road is straight at both ends of the bridge. If the new bridge is reconstructed in the current position, the same, best alignment can be achieved.	・The current access road is almost straight. If the bridge is reconstructed downstream, the road will include S-shaped curves, which will affect the alignment between the road and the bridge.
	Necessity for detours	・The new bridge is to be constructed upstream. The current bridge and access road can be used as they are; no detour is needed.	・As the new bridge is to be rebuilt in the same position, the current bridge and access road cannot be used during the construction; a detour needs to be provided.	・The new bridge is to be constructed downstream. The current bridge and access road can be used as they are; no detour is needed.
	Environmental and social considerations	・There is one (vacant) private land lots surrounded by fences; the premise must be expropriated. ・There are one plant site surrounded by fences and a building; the land needs to be expropriated and the building to be dismantled and relocated.	・The new bridge is to be rebuilt in the same position. No relocation of residents or land expropriation is needed.	・There is one quite large hotel in service, which needs to be dismantled and relocated. ・There is one tannery, which needs to be partially dismantled and relocated. ・The vacant lots surrounding the bridge must be expropriated.
	Workability	・An access road needs to be provided. In the meantime, the current bridge and access road can be used as a detour during the construction.	・The construction of an access road is not needed. On the other hand, a temporary bridge and detour need to be provided.	・An access road needs to be provided. In the meantime, the current bridge and access road can be used as a detour during the construction.
	Construction works to be included (Ratio to the estimated cost)	・Construction of a new bridge, construction of a new access road (Ratio to the estimated cost: 1.02)	・Construction of a new bridge, construction of a temporary bridge and a temporary road, removal of the current bridge (Ratio to the estimated cost: 1.00)	・Construction of a new bridge, construction of a new access road(Ratio to the estimated cost: 1.02)
	Overall evaluation	・The linearity will be worsened as the access road will include two curves. ・Environmental and social considerations will pose a serious concern, as this option requires the removal and relocation of buildings as well as the expropriation of land. ・The construction of a new access road requires a considerable cost, resulting in a lower economic efficiency. △	・This is the best solution in terms of linearity, as the current linearity will be maintained. ・This is the best solution in terms of environmental and social considerations, as there is no need for the relocation of residents or land expropriation. ・While the construction of a temporary bridge and a detour and the removal of the current bridge require a certain amount of cost, there is no cost needed for constructing a new access road, resulting in the highest economic efficiency. ○	・Linearity will be significantly worsened because the access road will have S-shaped curves. ・Environmental and social considerations will pose a serious concern, as this option requires the removal and relocation of buildings as well as the expropriation of land. ・The construction of a new access road requires a considerable cost, resulting in a lower economic efficiency. △

Table 2-2-5 Secondary comparison of the bridge positions (Modjo Bridge)

No.	Evaluation item	Alternative 1 (shifting 40 m upstream)	Score	Alternative 2 (reconstruction at the current position)	Score
1	Linearity of the access road	• The insertion of two s-shape curve at the junctions to the existing road will compromise linearity of the road significantly and also compromise drivability of the road	2	• A curve in the existing road will be the only curve in the access road and the linearity of the existing access road will be maintained.	3
2	Road widths	• Carriageway: 7.3 m (3.65 m x 2) • Shoulders: 0.5 m x 2 • Sidewalks: 2.5 m x 2 • Effective width: 13.3 m	5	• Carriageway: 7.3 m (3.65 m x 2) • Shoulders: 0.5 m x 2 • Sidewalks: 2.5 m x 2 • Effective width: 13.3 m	5
3	Longitudinal alignment	• The current longitudinal slope is approx. 5 %. Reduction of the slope to 3.5 % will require approx. 5 m of embankment.	3	• The longitudinal slope is 3.4 %.	5
4	Environmental and social considerations (including purchase of land)	• There will be no relocation of residents • Area of land expropriation: 59,740 m^2 (= 995 m x 50m)	3	• There will be no relocation of residents. • There will be no land expropriation (There will be a need to lease land for a temporary bridge and a	5
5	Detour at emergency	• It will be possible to use the existing bridge as a detour. However, very strict restriction will have to be imposed on the traffic on the bridge.	5	• It will be possible to use the old A1 Trunk Road as a detour. However, the surface of the road is so poor with several holes on the deck slabs that very strict	4
6	Construction costs	Work components • Road width (effective width): 13.3 m • A total length of the access road: 995 m • Bridge length: 95 m • Height of the embankment: 5 m • Ratio to the estimated construction costs: 1.10	1	Work components • Road width (effective width): 13.3 m • A total length of the access road: 190 m • Bridge length: 90 m • A temporary bridge and a detour: 380 m • Ratio to the estimated construction costs: 1.0	5
7	Overall evaluation	• The largest difference from the Alternative 2 is the construction costs • The Alternative 1 will require an access road longer than the Alternative 2 and embankment.	19	• The Alternative 2 is superior to the Alternative 1 in terms of construction costs, land expropriation and longitudinal slope.	27

* Scores 5: Best 4: Good 3: Intermediate 2: Not good 1: Worst

2-2-5 Detours

1) Gogecha Bridge

The selection of the current position as the new bridge position has created a need for a detour. The Alternative 1 (a detour 25 m upstream) was selected as the best alternative for the following reasons. (See Table 2-2-6)

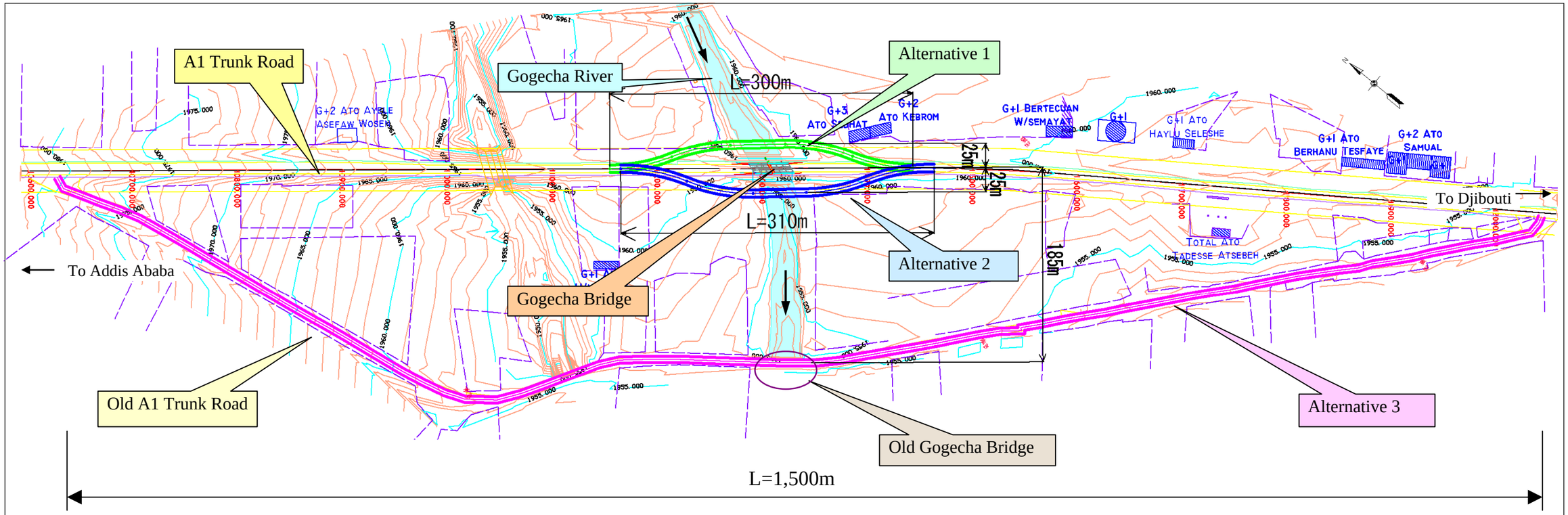
① The location of the detour 25 m away from the existing bridge and road will ensure convenience.
② It will be easy to construct a temporary bridge and a detour because the river bed is flat and the water level is low.
③ There will be no significant problem requiring environmental or social considerations.
④ The Alternative 1 has the best economic efficiency because of the shortest length of the detour among the three alternatives.
⑤ As the alternative to use the Old A1 Trunk Road (Alternative 3) is the economically least efficient because of the costs required for removal of old Gogecha Bridge, construction of a temporary bridge and improvement of the road surface, it is difficult to find a reason to adopt this alternative.

2) Modjo Bridge

The selection of the Alternative 2 (reconstruction at the current position) for the bridge position has created a need to construct a detour. The Alternative 1 (a detour 25 m upstream) was selected as the best alternative for the following reasons. (See Table 2-2-7)

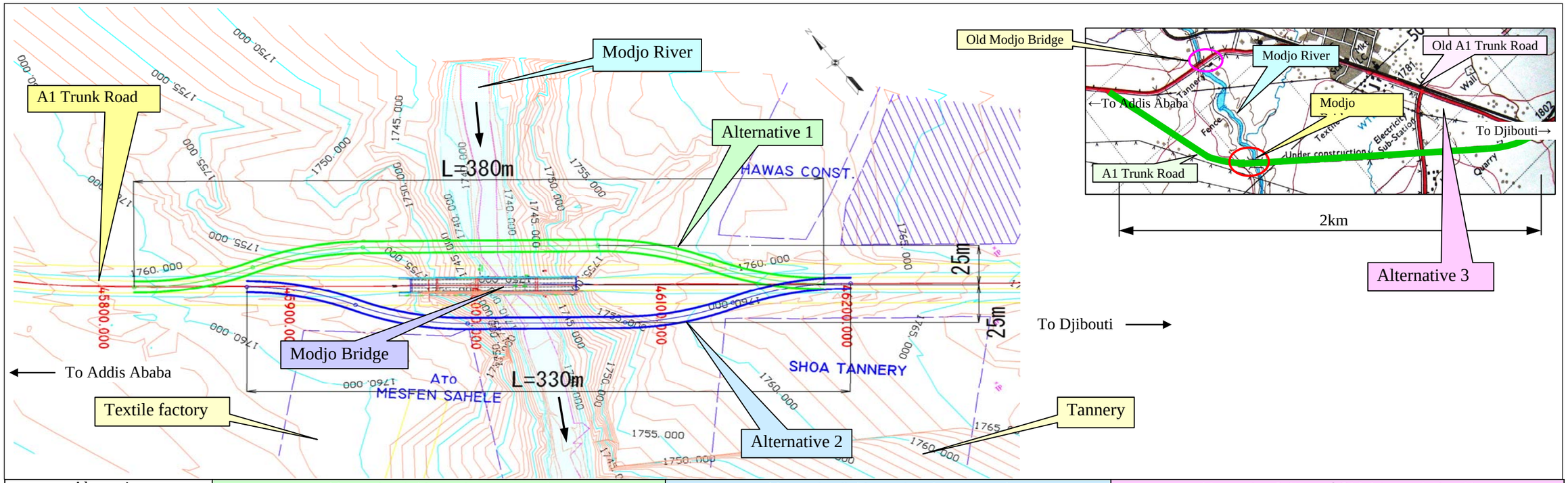
① The location of the detour 25 m away from the existing bridge and road will ensure convenience.
② Lowering the height of the river-crossing section on the detour will make construction of a temporary bridge easy.
③ There will be no significant problem requiring environmental or social considerations.
④ The Alternative 1 is economically efficient because of the short length of the detour.
⑤ As the alternative to use the Old A1 Trunk Road (Alternative 3) is the economically least efficient because of the costs required for removal of old Modjo Bridge, construction of a temporary bridge and improvement of the road surface, it is difficult to find a reason to adopt this alternative.

Table 2-2-6 Detour comparison table (Gogecha Bridge)



Alternative		Alternative 1 (Detouring upstream)	Alternative 2 (Detouring downstream)	Alternative 3 (Use of Old A1 Trunk Road)
Outline		・A detour is provided 25m upstream from the current bridge.	・A detour is provided 25m downstream from the current bridge.	・Old A1 Trunk Road is used as a detour.
Evaluation	Convenience	・The detour will be only 25m away from the current bridge with a total length of mere 300m; the degree of convenience is very high.	・The detour will be only 25m away from the current bridge with a total length of mere 310m; the degree of convenience is very high.	・The detour will be 185m away from the current bridge with a total length of 1,500m; the degree of convenience is extremely low.
	Conditions at the candidate site	・It is not difficult to set up a detour because the land next to the current bridge (on the upstream side) and the private premises surrounded by fences are vacant.	・It is slightly difficult to set up a detour compared with Alternative 1 because there is a gas station surrounded by walls on the Djibouti side of the river downstream from the current bridge. The land on the Addis Ababa side is vacant.	・The condition of the pavement of Old A1 Trunk Road is rather poor. If it is to be used as a detour, repaving is indispensable. ・Old Gogecha Bridge has a width of one lane only and is considerably superannuated. If it is to be used as a detour, it needs to be rebuilt.
	Difficulty in constructing a temporary bridge	・The Gogecha River has a relatively-flat bed, though with some boulder stones, and a shallow depth. It is not difficult to set up a temporary bridge.	・Same as left	・No need for setting up a temporary bridge, but Old Gogecha Bridge (the current bridge) needs to be rebuilt.
	Environmental and social considerations	・The leasehold of the two (vacant) private land lots surrounded by fences will be required.	・The leasehold of the gas station surrounded by walls will be required.	・The current road (Old A1 Trunk Road) will be used; no leasehold will be needed.
	Workability	・The land next to the current road is vacant and the private lands surrounded by fences are also vacant; constructing a detour is highly workable.	・While the land next to the current road (on the Addis Ababa side) is vacant, there is a gas station surrounded by walls on the Djibouti side. Thus, the workability is not as good as that of Alternative 1.	・The workability is very low because virtually the whole section of the 1,500-m detour must be repaved and the current bridge (Old Gogecha Bridge) be rebuilt.
	Construction works to be included (Ratio to the estimated cost)	・Construction of a temporary bridge, construction of a detour (Ratio to the estimated cost: 1.00)	・Construction of a temporary bridge, construction of a detour (Ratio to the estimated cost: 1.01)	・Reconstruction of Old Gogecha Bridge, repaving of Old A1 Trunk Road (Ratio to the estimated cost: 2.22)
	Overall evaluation	・The degree of convenience is high in terms of detouring. ・The construction of a temporary bridge and a detour is not difficult. ・No particular problem in terms of environmental and social considerations. ・The shortest length of detouring will result in the highest economic efficiency. ○	・The degree of convenience is high in terms of detouring. ・While the construction of a temporary bridge is not difficult, the construction of a detour is slightly difficult. ・No particular problem in terms of environmental and social considerations. ・As the length for detouring is short, the economic efficiency is the second best following Alternative 1. △	・The degree of convenience is low in terms of detouring. ・The workability is extremely low, as this option requires the reconstruction of Old Gogecha Bridge as well as the repaving of Old A1 Trunk Road. ・The economic efficiency is the lowest among the three options. ×

Table 2-2-7 Comparison of detours (Modjo Bridge)



Alternative		Alternative 1 (Detouring upstream)	Alternative 2 (Detouring downstream)	Alternative 3 (Use of Old A1 Trunk Road)
Outline		・A detour is provided 25m upstream from the current bridge.	・A detour is provided 25m downstream from the current bridge.	・Old A1 Trunk Road is used as a detour.
Evaluation	Convenience	・The detour will be only 25m away from the current bridge with a total length of mere 380m; the degree of convenience is very high.	・The detour will be only 25m away from the current bridge with a total length of mere 330m; the degree of convenience is very high.	・The detour will be 1km or more away from the current bridge with a total length of approx. 2km; the degree of convenience is extremely low.
	Conditions at the candidate site	・The land next to the current road (on the upstream side) is vacant. The Modjo River runs through steep valleys. ・The bridge surface is more than 20m above the riverbed. ・Consequently, it is extremely difficult to set up a temporary bridge at the same height as the current bridge. The height of the detour must be lowered.	・There is a textile plant next to the current road (on the downstream side). The Modjo River runs through steep valleys. ・The bridge surface is more than 20m above the riverbed. ・Consequently, it is extremely difficult to set up a temporary bridge at the same height as the current bridge. The height of the detour must be lowered.	・While the condition of pavement on Old A1 Trunk Road is poor from place to place, it can be used as a detour after simple repaving, such as Macadam's paving, is applied. ・Old Modjo Bridge is more than 50 years old, and its load carrying capacity is not sufficient. Thus, it is difficult to use it as a detour.
	Difficulty in constructing a temporary bridge	・It is not difficult to set up a temporary bridge, as there is ample space for constructing a detour, and lowering the height will allow the temporary bridge to have a single span (30m).	・Same as left.	・Due to the lack of load carrying capacity, Old Modjo Bridge must be removed and a temporary bridge needs to be provided.
	Environmental and social considerations	・There is no particular issue in terms of environmental and social considerations, as there are only vacant lands, mountains and forests, and no single building.	・There are two textile factories along the current road. The leasehold of the land is needed.	・The current road (Old A1 Trunk Road) will be used; no leasehold will be needed.
	Workability	・There is no particular issue in constructing a detour (road section). The construction of a temporary bridge can also be made easy by lowering the height.	・Same as left.	・Old Modjo Bridge must be removed and a temporary bridge needs to be provided. ・Though the old national road must be repaved, the work itself is not difficult.
	Construction works to be included (Ratio to the estimated cost)	・Construction of a temporary bridge, construction of a detour (Ratio to the estimated cost: 1.00)	・Construction of a temporary bridge, construction of a detour (Ratio to the estimated cost: 1.01)	・Construction of a temporary bridge, simple paving of the old road, removal of the old Modjo Bridge (Ratio to the estimated cost: 1.10)
	Overall evaluation	・The degree of convenience is high. ・The construction of a temporary bridge can be made easy by lowering the height of the detour at the river-crossing point. ・There is no particular issue in terms of environmental and social considerations. ・The smaller scale of the temporary bridge will lead to a higher economic efficiency. ○	・The degree of convenience is high. ・The construction of a temporary bridge can be made easy by lowering the height of the detour at the river-crossing point. ・In the aspect of environmental and social considerations, the leasehold of the textile factories will be needed. ・The smaller scale of the temporary bridge will lead to a higher economic efficiency. △	・The degree of convenience is poor. ・Old Modjo Bridge must be removed, and a temporary bridge needs to be provided. ・Though the Old A1 Trunk Road must be repaved, the work itself is not difficult. ・The repaving of the Old A1 Trunk Road leads to a poor economic efficiency. ×