Phase II – Transport-Cost Report

Development of a National Port Strategy for Yemen

Prepared for:

Port Cities Development Program

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The Cornell Group, Inc., USA

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The following section analyzes the costs of inland transport with the aim to optimize total transport costs of imports and exports. This analysis should facilitate the selection of the best location for investment from both technical and economic perspectives, taking into account the comparative advantages of the ports of Hodeidah, Aden and Mukalla.

I. Methodology

Logistics costs

Following exhibit gives a breakdown of all cost components making up the general logistic costs.

Exhibit 1: Typology of total direct and indirect Logistics Costs

	Direct Logistics Costs	Indirect Logistics Costs
Overhead or alternative costs	Inventory carrying costs Value of time Operational IT costs	Cost of lost sales Customer service level costs Obsolescence costs IT maintenance
Function related	Transport cost (freight) Cargo handling Warehouse/storage Fairway fees Documentation Telecom costs	Packaging IT costs (personnel) Cost of capital in logistics equipment Administration

Source: The Cornell Group Inc.

This section is primarily dealing with the first three positions of "function-related direct logistics costs": pure transport cost, cargo handling and warehouse storage, since these are related to the various distances covered (operating costs). However, the section will also cover costs of time and of capital in logistics equipment (trucks), since these are related to time values (fixed costs).

Measures of transport costs

Transport cost approximations based on ad-valorem shares of trade values

An interesting methodology has been developed to overcome the limits of *a priori*-fixed measures and to disentangle *ad valorem* shares of trade values across destinations, modes and industries. It consists in comparing the value of trade flows inclusive and exclusive of freight and insurance costs. These values are often reported to national customs by both importers and exporters. The fob (free-on-board) value measures the value of an imported item at the point of shipment by the exporter, as it is loaded on to a carrier for transport. The cif (cost-insurance-freight) value is the corresponding imported-item value at the point of entry into the importing country. Therefore, it includes the cost of insuring, handling and shipping the item to the importer border, being however still exclusive of custom charges.

The above cif / fob approach goes into a similar direction as the Generalized Transport Cost (GTC) approach describes in the below section. However, the elasticity of cif / fob costs with respect to distance is fairly low, a 10% increase in sea distance between traders leading to a 1.3% increase of transport costs only. Thus, sea distance explains only approximately10% of the cif / fob variability.

However, elasticity of cif / fob costs is a significant degree better with respect to land distance. The following two exhibits recapture a price comparison in Yemeni major cities provided in Annex 25 of Cornell's Phase II – Traffic Demand Projections Report:

Exhibit 2: General Indicators of Wholesale Prices (YR / unit[1])

Commodity / City	Mukalla	Ibb	Hodeidah	Taizz	Aden	Sana'a
Wheat (white, imported)	2,370	2,550	2,192	2,375	2,200[2]	2,395
Sugar	2,742	2,825	2,753	2,925	2,793	2,892
Yemeni coffee (seeds)	7,000	9,458	7,958	10,444	7,227	9,800
Cigarettes (Rothmans)	1,150	1,150	1,079	1,150	1,140	1,142
Iron (12 mm)	103,750	101,000	98,900	92,125	100,917	108,333
Cement (local)	792	792	671	800	780	1,020
Cement (imported)	767	796	642	900	800	938

Note: [1] units depend on type of commodity and are of no relevance since stress is on comparison among different cities;
[2] estimate

Exhibit 3: General Indicators of Retail Prices (YR / kg)

Commodity / City	Mukalla	Ibb	Hodeidah	Taizz	Aden	Sana'a
Flour (white)	61	70	60	68	60	67
Rice (emile brand)	130	140	130	134	128	132
Potatoes	108	98	88	97	94	107
Oranges (local)	165	133	156	189	168	120
Veal meat (fresh)	717	900	992	858	1,021	879
Fish (fresh)	369	451	424	493	498	460

Source: EIU Economic Intelligence Unit, September 2007

Comparison of the 2004 wholesale and retail prices in both exhibits suggests that staple food like wheat or rice sold in the inland cities of Taizz and Ibb is charged an average 10% higher price than products sold in the port cities of Hodeidah, Aden and Mukalla. This holds true only for products imported from overseas.

Overall, prices are on a higher level in Taizz and Ibb. Sana'a presents a certain exception in that either products are transported into the city at competitive prices, or better competition in the commercial sector keeps prices lower. It appears that demand for staple food might be somewhat lower in the cities of Taizz and Ibb compared to Sana'a and the port cities.

This method is not accurate enough, however, particularly since it reflects freight charges rather than true transportation costs. Disadvantages of this approach are described in below section.

Transport cost approximations based on expenditure for freight and insurance charges

Another more advanced step towards gathering and analyzing such dispersed information provides stylized facts on the levels and variations of freight expenditures coming from many data sources. However, aggregating transport charges across industries misinterprets the true magnitude of shipping costs due to composition effects. Large variations of transport costs depend on both modes and periods. Also, the collection of such data is still limited to some goods, modes and countries.

Freight rates also depend on taxes and fees related to the development and use of the infrastructure. Recent concerns about sustainable development also lead public authorities to implement policies designed to correct environmental, insecurity, noise or congestion externalities. This embodies in new norms or regulations, which affect the energy and

operating costs, but also resume in direct fees or taxes on top of those possibly related to the infrastructure construction and maintenance.

Besides, fuel prices have also been subject to fluctuations summing up in a significant net decrease, including both direct fuel price changes and new fuel tax regulations. Yemen did not fully pass through the rise in world fuel prices to local customers. Retail fuel prices remain well below international levels (for instance, compared to prices in the United States). The pass-through from international to domestic retail gasoline prices between end-2003 and mid-2008 (defined as the ratio of the absolute change in domestic gasoline prices to the equivalent change in the United States1) was only partial in Yemen. This low pass-through has been associated with explicit fuel subsidies. Explicit subsidies mainly reflect budgetary compensation to national energy or refining companies, and are expected to exceed 3 percent of GDP in 2008 in the Republic. These explicit subsidies have also increased because Yemen relies on universal fuel subsidies for the country's safety net.

Finally, freight and insurance expenditures greatly depend on the degree of competition – supply monopolies heavily increase these expenditure levels. The monopoly situation of freight carriers on some destinations may give them incentives to price discriminate across locations or customers. The transporter's bargaining power may also contribute to the existence of high freight rates, as do some informal barriers to entry erected by public authorities, such as the 'grand-fathering' way of allocating slots.

Generalized transport costs

Comparing above measures, such as shares of trade values or freight & insurance charges, to the below alternative, Cornell concludes that below proxies do a very good job in capturing transport costs in cross-section analysis[1].

Based on the real transport network, the transport-cost measure encompasses the characteristics of the infrastructure, vehicle and energy used, as well as labor, insurance, tax and general charges borne by transport carriers.

- *Itinerary:* Transport-cost measures depend on the itinerary chosen between the origin and the destination of the trip. This criterion encompasses three underlying effects:
  - *Distance:* Transport cost measures depend on the real distance incurred between origin and destination. Transport costs increase with the distance between origins and destinations, since it is more costly, due to energy consumption among others, to travel or to deliver goods faraway than close by. The mean elasticity of trade with respect to distance is large, at -0.85.
  - *Time:* Transport-cost measures depend on the real time elapsed between origin and destination. Increasing concerns about fast deliveries led to refer to time as a major component of transport costs. Modern industries bear time-delivery constraints due to increasing flexibility, inventory costs or "just-in-time" practices. The truism "time is money" encompasses the feature that an increasing proportion of trade nowadays includes high-valuable or perishable goods that need secure and fast delivering associated with large freight and insurance costs.
  - *Direction:* Transport cost measures depend on the direction of the trip. Transport costs are not necessary symmetric for a given pair of origin and destination. For instance, congestion might entail delays on one way of the trip only. Moreover, other

[1] *Source:Transport Costs: Measures, Determinants, and Regional Policy Implications for France, Pierre-Philippe Combes, Miren Lafourcade, Paris, France, May 2004*

discrepancies might arise from origin and destination differences in the costs of boarding and containerization or from an asymmetric configuration of the network.

- *Transport mode:* Transport-cost measures depend on the transport mode used, which is the combination of a transport infrastructure and of a transport vehicle. Transport costs depend both on the infrastructure (road, rail, airports, or ports) and on the vehicle used (truck versus pick-up for road-cargo transport for instance).
- *Energy:* Transport cost measures depend on the cost of the energy used.
- *Other operating costs:* Transport cost measures depend on the other operating costs, wages for instance.
- *Commodity:* Transport-cost measures depend on the commodity transported. The nature of the commodity makes it more or less expensive to transport. This may be due to the size of batches, to specific freight and insurance charges related to the quality or price of the transported item, but also to its perishable nature, the extent to which it has been processed, its solidity, liquidity or dangerousness.

Analytical approach to determining generalized transport costs

Definition of inland transportation costs to/from origins and destinations of cargo

The following defines the various components of GTC.

Cargo origins: As argued in Section III of Cornell's Phase II – Traffic Demand Projections Report, the analysis concentrated on Yemen's five major commercial ports, since the Republic's minor ports constitute remnants of the past whose accumulated volume of the total cargo discharged and loaded in these five ports taken together at no year exceeded 15,000 tons during any of the last four years.

Cargo destinations: Cornell took population centers of 10,000 heads and more as primary destination of import cargoes, since these centers (1) provide for considerably stronger purchasing power compared to Yemen's rural areas, and (2) serve as distribution centers (trading points) for the rural areas. Oil and gas exports were not considered since these are not operated through the Republic's commercial ports. On contrast, Cornell analyzed transportation costs of minerals to be potentially exported through the commercial ports, as described in Section IV of the Traffic Demand Projections Report.

Direction: Yemen's economy is almost entirely driven by imports providing for the Republic's fast growing population. Most of the national production is based on primary products both originating and consumed within the country. With the exception of mineral exports as future business opportunities, the following analysis therefore took as reference points the Yemeni commercial ports as origin, and the population at large as destination, of the investigated cargo flows.

Transport mode: As regards the transport mode, Cornell focuses on the trucking industry since the vast majority of trade volumes is shipped through the road network.

Commodity: Importantly, GTC does not depend on the good shipped, since it consists in the costs of driving a representative truck from one place to another.

However, since GTC corresponds to a specific mode and vehicle type (various road and truck categories), it may therefore apply to some commodities only. For instance, containers are generally hauled on trailers and heavy dry bulk is carried on 3-axle trucks, whereas 2-axle trucks are employed primarily for breakbulk cargo. Furthermore, in this class of commodities, if one knows the number of units that can be loaded in the vehicle, the GTC per unit shipped does depend on the commodity. Finally, if one incurs extra costs due to special packaging for instance, as for fragile goods, those can be directly added to the GTC per unit shipped, which easily makes it dependent on the good transported.

Reference costs – road transportation

GTC encompasses both distance and time costs related to shipments (please see Annex 1). Also, *energy and other operating costs* are covered by reference costs.

Total cost per km obtained from adding distance and time reference costs considering the speeds on each corridor.[2] Average speeds of a 2-axle truck by road type have been chosen in accordance with free-flow averages of 80 km/h for 2x2-lane national roads, 60 km/h for 2x1 national roads, 40 km/h for secondary roads, and 20 km/h for feeder roads.[3] For a 3-axle truck, average speeds were reduced by 5 km/h and for a trailer by 10 km/h for each road category.

Traveling on some road sections is more expensive than on others, in terms of distance costs but also of time costs since, even if time-related reference costs do not depend on the road category, the speed does. However, cheapest types according to each criterion are not the same.

Reference costs – maritime freight

For calculation of differentials in maritime freight costs from the port of Hodeidah to Aden (380 km), and from the port of Aden to Mukalla (500 km), Cornell applied the daily dry time-charter rates (which are therefore approximate for vessel costs) as of October 2008 (after charter rates had come down to a long-year average and before the global economic recession began to 'bite') of going vessel sizes presently employed in the shipping market. A 20% premium was added to account for wet charter (including crew, ship diesel and oils). Subsequently, Cornell calculated for these vessel sizes the steaming time to cover above distances, assuming an average speed of 25 knots for container ships, 23 knots for dry bulkers and 21 knots for breakbulkers. Finally, from the capacity of these vessels Cornell calculated the maritime freight costs per TEU and per ton for dry bulk and breakbulk (neo-bulk and bagged cargo).

Data collection

Road categories: As basic underlying information, Cornell utilized an actualized road network map provided by the Road Maintenance Fund of the Ministry of Public Works & Highways. This large-scale map distinguishes between national and secondary roads, and also depicts roads under construction and under study.

Road difficulties: A description of road difficulties was also provided, distinguishing between 'easy' and 'difficult' degrees of three quality levels (asphalt, dirt and off-road). Cornell verified the proportion of difficult road sections by help of a detailed topographic map. Additionally, Cornell consulted the Google Earth program and surveyed the road system on a larger scale. Excerpts of images are included in the main sections below.

Road conditions: Cornell utilized year-2008 statistics on road conditions, as provided by the Road Maintenance Fund. Road conditions, mainly of embankment and asphalting, were distinguished between four levels A (good) to D (bad). On major road sections, Cornell verified their conditions through inspections on site and laid them out on a map.

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[2] *Cornell did not consider the possibility of overcrowding, bottlenecks, safety or ease of driving for instance. The only part of the network on which Cornell partly corrected for the congestion bias are the Sana'a and Taizz regions for which Cornell assumes that speeds are systematically 30% lower than in other areas. This lower speed level considers neither unsystematic nor random overcrowding, whose measure would require data on the truck float and on the ton-km shipped for each corridor which is well beyond available statistics.*

[3] *Cornell developed these speed values from older statistical information provided by the Al Farzah Cooperative*

Road distances: A table on road distances was provided by the Ministry of Transport. Cornell complemented these statistics by measuring distances of secondary roads and non-tabularized national roads in the Google Earth program.

Population numbers and distribution: Data on population numbers by governorate, based on the 2004 National Census, were provided by the CSO Central Statistical Organization of the Ministry of Planning & International Cooperation. Cornell supplemented these data with a population distribution map and with figures of Yemen's major cities and towns from the internet based on CSO statistic).

Data analysis

Application of road and maritime costs: Based on above-described tools, Cornell applied the reference costs to Yemen's various road categories, difficulties and conditions. The analysis thereby distinguished between the different truck categories (2-axle truck, 3-axle truck, trailer). Cornell then calculated the cost differential for eastbound and westbound sea cargoes and correlated these maritime transportation costs with the road transportation costs.

Correlation of population and traffic projections: Subsequently, the present and predicted figures of consumer demand by the population distributed over the centers was directly correlated with the amount and types of commodities predicted (Section V of the Traffic Demand Projections Report) to be imported through the Republic's individual five commercial ports.

Correlation of truck categories and commodity types: Cornell then applied the major commodity types to the different truck categories. As a result, various transportation ranges of the major commodities could be defined in accordance to the transportation costs incurred by the different truck categories.

Hinterlands of individual cargo types: Finally, a comparison of the resulting transportation costs between the Republic's individual commercial ports and its population centers indicated potential port hinterlands more distinct than those proposed in Section III of Cornell's Phase II – Traffic Demand Projections Report.

Recommendations

Based on above-described analysis, Cornell drew conclusion and gave recommendations as to the

- comparative transportation-cost advantages of individual major commercial ports,
- most economical location for each type of cargo,
- optimum hinterland areas of Yemen major commercial ports,
- freight rate setting based on true road transportation costs, and
- specific transportation-cost advantages of the future ports of Dhaba against Burum.

Any user of these recommendations has to keep in mind, however, that cost advantages as applied in the real transportation market through freight charges will differ significantly from advantages based on true transportation costs as calculated in this report section. Most importantly, freight transport companies should strife at taking these true transportation costs as basis for calculating their freight rates in the rather intransigent transport market within the Republic of Yemen.

II. Analysis of inland transportation costs to/from origins and destinations of cargo

Road categories, difficulties and conditions

Road categories

Whereas the major commercial ports of Hodeidah, Aden and Mukalla are connected to their respective hinterlands across three national roads spreading into different directions, the smaller commercial ports of Saleef and Mokha until very recently had been dependent on one lifeline artery (please see Exhibit 4).

Hodeidah: The port of Hodeidah is connected with its hinterland across three national roads, heading north to Harad and onwards to Saudi Arabia, east to Sana'a and onwards to Marib and Safer, and south diverting towards Taizz and the port of Mokha. This network is complemented by west-east running secondary roads connecting the northern national road with the major south-north national artery at Huth and at Amran, and with a northwest-southeast running secondary road connecting the eastern national road across one diversion with Dhamar and Bayda, and across a second diversion with Yarim and Ibb.

Saleef: An additional national road connecting the northern national road with Sana'a serves a more significant purpose for the port of Saleef. This connection would become even more important if a missing road from this port to Az Zaydiyah on the northern national road was completed. Also, construction of a national road is planned to be commenced in 2009, connecting the port with the town of Midi and onwards into Saudi Arabia.

Mokha: The main artery of this port is the national road connecting east to the city of Taizz, with the national road towards Hays, Zabeed and Hodeidah branching north after about 55 km. Also, the road connecting Mokha with Hodeidah (expected to be finalized during 2009) will open up the populated coastal area between these two port cities. On contrast, the recently finalized national road heading south from Mokha to Bab al Mandab and onwards to Aden passes through Yemen's mostly unpopulated southwestern region.

Aden: This port is connected across the major national artery going north via Taizz and onwards to the city of Sana'a, and two coastal national roads completed very recently connecting the port westwards with Mokha via Bab al Yemen, and eastwards via Shuqrah to Mukalla. The former inland national road is being amplified and straightened from Aden to Amran via the City of Sana'a. Road construction is to generally follow the existing national road, except for two sections in the mountainous area, which will require at least six years to be built. The latter coastal connection replaced the, formerly only existing, eastward national inland road thereby saving about 100 km of transport distance. The triangular areas between these national roads are served by one secondary road cutting northwest through to the Mokha-Taizz national road, and another secondary road connecting the port northeast to Bayda.

Exhibit 4: Road Network Categories in the Republic of Yemen, 2008

Mukalla: The national coastal road from Aden continues eastwards via Al Ghaydah to Oman. The national road into the Hadramout branches off the coastal road 20 km east of Mukalla. Apart from a secondary road running western parallel to the northern section of the Hadramout road, there are no other secondary roads in the immediate hinterland of Mukalla.

This road grid is complemented by a small number of secondary roads either connecting rural centers further inland or serving the role of rural feeder roads. Naturally, the road grid is densest around the inland urban agglomerations of Sana'a, Taizz and Wadi Hadramout. The Government of Yemen is heavily investing into building this feeder-road grid denser, both around the three inland agglomerations and extending it into the central region of Shabwah and surrounding governorates. However, by having a road constructed from the governorates of Amran and Al Jawf to the city of Al Boqa the Government of Yemen is also improving the international road connection into Saudi Arabia. In the east of the Republic, major roads are planned from Al Boqa in Al Jawf governorate to Thamud in Hadramout governorate, and from the east-west inland international road crossing Al Maharah governorate to Al Ghadayah at the Arabian Sea coast.

Road Difficulties

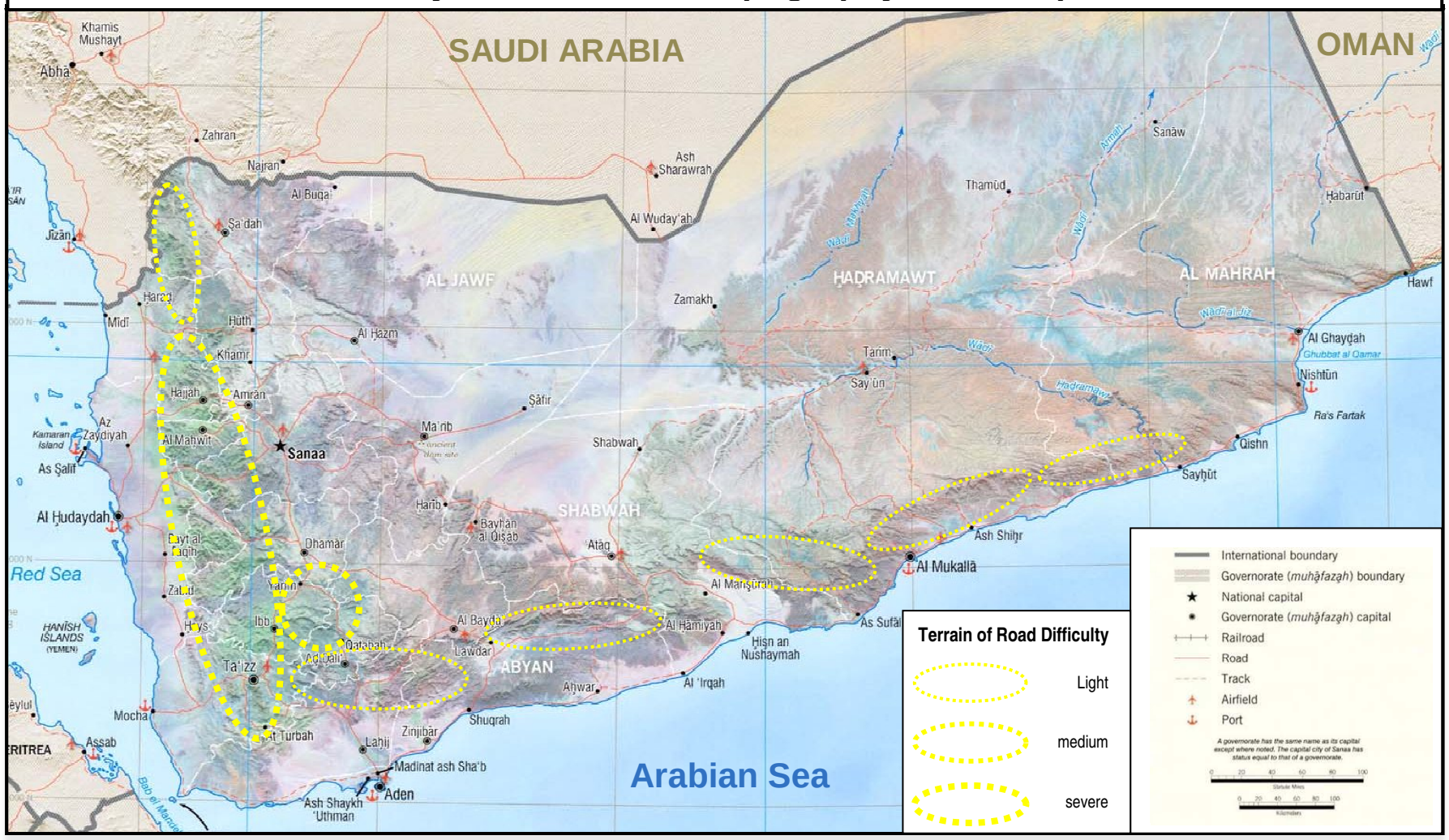
Road difficulties arise from mountainous terrain resulting in alignments with steep in/declines and sharp curve gradients. Following Exhibit 5 plastically depicts Yemen's physical topography and the resulting alignment of mayor roads. Obviously, the central highlands pose a major barrier towards the Tihama plains to the west. This barrier results in the narrow, steep and winding roads such as the secondary road between At Tawr and Amran, and the national roads between Az Zaydiyah and Shibam Kaukaban in Hodeidah and Mahweet governorates, between Bajil and Sana'a in Hodeidah and Sana'a governorates, and west of the city of Taizz in Taizz governorate.

Passing the mountains fringing the plateau areas in the central highlands also puts a heavy strain on road alignment. This holds particularly true for the south-north central arterial national road passing through a range of mountain peaks from north of Taizz to south of Dhamar, and again for a large sectionof the national road north of Hajjah. The southern coastal highlands also cause a shorter road section at Al Rawdah to meander heavily.

Overall, connections in the hinterland of Hodeidah Port have the highest degree of road difficulty compared to those in the hinterland of the ports of Aden and Mukalla.

The following exhibits depict various series of particular difficult road alignments, taken as space images from Google Earth. The yellow line on the images has been created artificially by the computer program, but generally follows the road alignment to a high degree.

Exhibit 5: Road Difficulty due to Terrain Topography in the Republic of Yemen, 2008



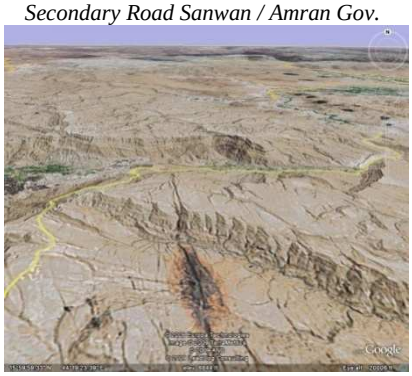
Saleef – Amran Governorate:

Following three images were selected from national and secondary roads in the hinterland of Saleef Port.

Port of Saleef / Hodeidah Gov.

National Road at Huth / Amran Gov.

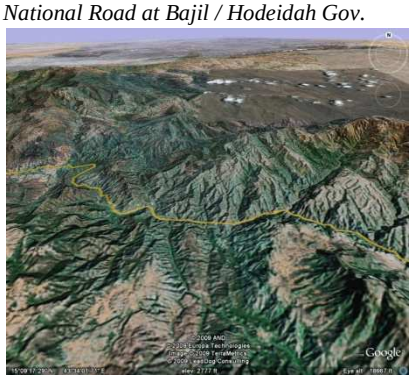
Secondary Road Sanwan / Amran Gov.



Hodeidah – Sana'a:

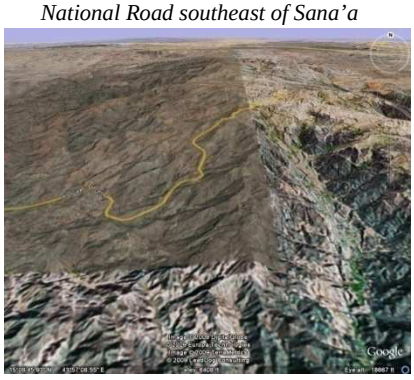
Rugged terrain puts a heavy strain on the national road connecting the port of Hodeidah with the city of Sana'a.

National Road at Bajil / Hodeidah Gov.



National Road at Safan / Hodeidah Gov.

National Road southeast of Sana'a



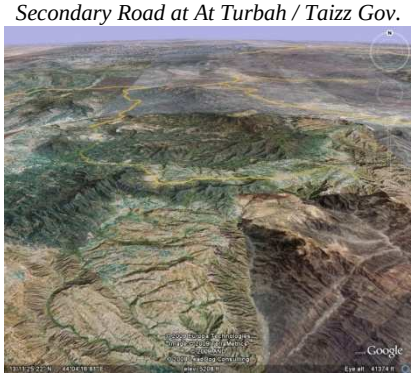
Mokha – Taizz:

Following three images were selected from national and secondary roads in the hinterland of Saleef Port.

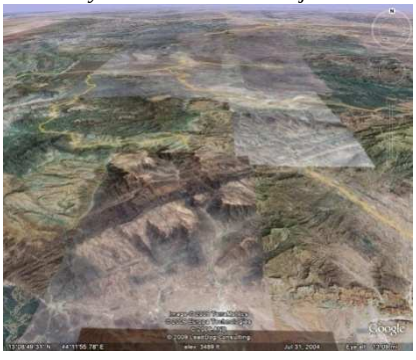
National Road at Maqbanah / Taizz Gov.

National Road at Masha'a / Taizz Gov.

Secondary Road at At Turbah / Taizz Gov.



Secondary Road at Bunah / Lahij Gov.



National Road at Jibblah / Ibb Gov.

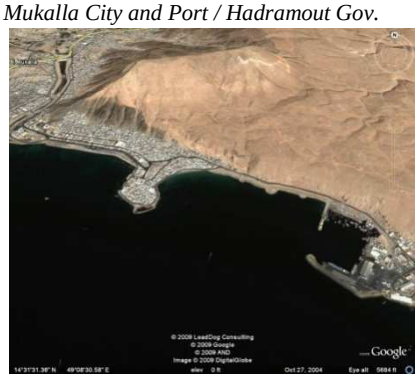
National Road at Yarim / Ibb Gov.

Burum / Mukalla – Hadramout:

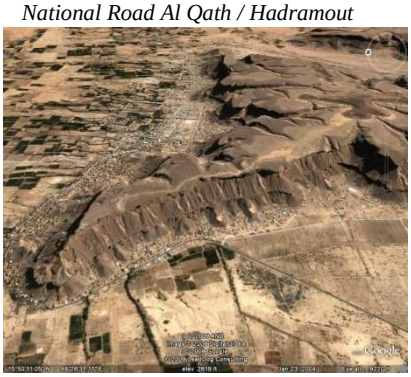
Expansion of the national road at Mukalla, to facilitate the easy flow of heavy truck traffic around the city's center, will be difficult due to the mountain range north of Mukalla.

National Road at Mukalla / Hadramout

Mukalla City and Port / Hadramout Gov.



National Road Al Qath / Hadramout



In contrast to mountainous areas, road alignments in desert regions can be laid out relatively straight forward, although the underground at times might put some strain on the embankment.

Road conditions

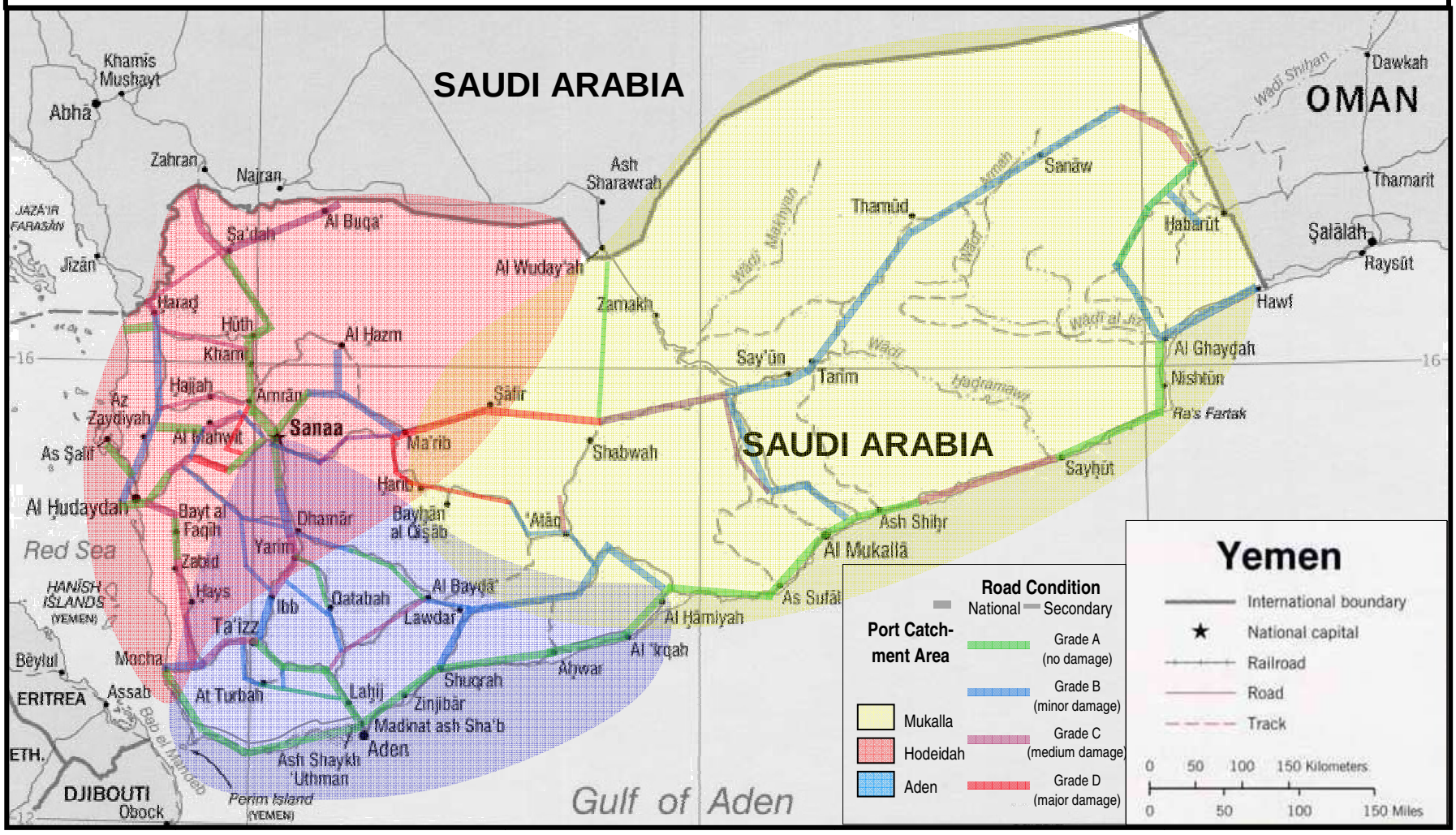
Regular maintenance is required to keep the road network in good shape. Road maintenance reduces traffic accidents and human and financial loss. To this aim, the Yemeni government implemented relevant projects to maintain and overlay several national roads. Most importantly, the overlay of the Mukalla-Sayoun-Tarim road was done covering 332 km in addition to the overlay of similar roads (for instance, 265 km of the Mukalla-Sayhut and 226 km of the Sana'a-Hodeidah road).

Road conditions, mainly of embankment and asphalting, were distinguished between four levels A (good) to D (bad). Actual road conditions, categorized by four quality degrees, are depicted in below Exhibit 6. Most significant quality deficiencies exist in the

- road grid within Sa'adah and Al Jawf and national road connecting to Saudi Arabia,
- hinterland of Hodeidah towards the central highland with city and environment of Sana'a,
- national roads connecting Mokha and Aden with Hodeidah and Sana'a, and
- road grid east of Marib posing heavy difficulties on truck traffic from Hodeidah Port.

At present, bad road conditions on these roads effectively limit the hinterland of all commercial ports in Yemen.

Exhibit 6: Port Hinterlands based on Transportation Cost Advantages and Road Conditions, 2008



Barriers to international trade and transport

The list of direct and indirect barriers to trade and transport is very long. Indicated barriers include:

1. Corruption,
2. Transparency and access to information,
3. Role of the state and international agreements: regional cooperation, multilateral conventions and bilateral arrangements,
4. Customs and other border agencies,
5. Efficiency of transport operators,
6. Under-developed logistics services,
7. Multi-modal transport still to be developed, and
8. Physical infrastructure impediments.

High transaction costs

The current fundamental obstacles to trade in the Yemen Republic range from the micro to the macro: very high transaction costs on firms, the dead weight of bureaucratic impediments to private business, highly protected trade regimes, and an inhospitable environment for private investment. Trade is hampered in the region because state-owned transport facilities and customs, bureaucracy and red-tape stifle cross-border transport - the average freight cost in the Middle East region constitutes 12% of transaction value, or three times as large as it is in other countries with similar geography (such as Turkey). Trade is also depressed because the private sector faces wide-spread regulatory and administrative bottlenecks. In particular:

- non-transport trading costs (and excluding customs duties and domestic taxes) were some 11% of transaction value to conform to product standards, inspections, conformity certification, transshipment regulations and the like;
- informal payments to customs and other regulators are significant, but even more crucial, it takes on average 2-10 days to release goods from customs and multiple documents and signatures; companies spend some 95 man-days on average dealing with such clearances; and
- more than half of all companies surveyed report that they do not benefit from trade agreements signed by their governments.

Beyond the incidence of these transaction costs, the trade regime of Yemen are among the most protected in the world. Tariffs are high and non-tariff barriers are widespread, and despite reforms to reduce these barriers, the country has fallen behind all other comparable regions[4].

Domestic and regional business environment

The business environment also constitutes a major bottleneck, with investors citing among other factors: business licensing, state monopolies, prohibited imports, employment of nationals, public-sector corruption, difficulties in legal-system enforcement of contracts, inability to repatriate capital, political instability, and unpredictability and reliability of policies, as some of the common factors deterring investment in intra-regional trade.

The countries in the region have attempted to form more free trade areas (FTA) than any other developing region, but the share of trade within these groups has shown only modest, if any,

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[4] *In Egypt, for example, the average rate of effective protection remains at about 31%, and in Jordan about 43%*

increase and relative to successful FTAs remains minimal. These have failed in part because of the low complementarity in member countries' trade (when countries' production structures are similar and their exports match the imports of their trading partners only poorly). In such a setting, countries have little to gain from regional arrangement and should focus on unilateral or multilateral trade liberalization.[5]

Not all the issues and constraints to trade emanate from within the region. The region's major trading partners also contribute to reduced possibilities and prospects for trade. For example, among all regions in the world, the region has a large number of countries that do not yet belong to the WTO. Yemen has a comparatively large population which is predicted to grow speedily and heavily. This region, therefore, benefits potentially the least from any round of multilateral trade liberalization or other trade agreements. Non-member countries of the WTO lack both voice and bargaining power regarding new policies and trade-related issues, and are not subject to rules-based systems in turn. This region also has a large number of countries affected by trade sanctions.

Conflict and wars fundamentally impede trade: In the Republic's north, the Sa'adah war during mid-2008 has – if not interrupted trade flows – seriously slowed down the hitherto constant trade flows with the Republic's northern neighbor.

Crossing the borders – road, customs and border management[6]

While the first seven categories of trade and transport barriers above, which are mostly of an institutional nature, determine the basis for trade and transport facilitation, the following physical shortcomings of the transport infrastructure are not negligible.

In international road transport, impediments become most obvious. They can be measured in the time lost in delays and the increased costs of transport. Corruption is reported to be the biggest cost item, but truckers are usually shy to be specific. Informal payments are often connected to the more specific impediments, like regular examination of cargoes even if they travel under TIR guarantee system and abuse with convoying. Technical provisions with regard to gross weight and axle load of vehicles, or different insurance schemes often lead to cumbersome inspections by the Traffic Inspectorate. This may also impose additional taxes and rent, as well as further delays at the borders.

Customs procedures can be characterized as over-reliance on physical inspection. They also often change, leaving room for arbitrary interpretation and application. Besides, customs rules are being interpreted in many different ways and there is evidence that the procedures themselves are not fully understood by those who have to administer them. Modern transit procedures are largely absent. Some customs organizations have adopted a policy of regular breaking of seals because they doubt the integrity of the previous Customs organization. This is often in breach of international conventions and makes effective control of transit traffic more difficult. Due to unpredictable transit times companies have to increase their stocks to levels that exceed the size required for the production process. Trade and transport still suffer from corrupt practices within the customs services, lack of modern and transparent border procedures based on interagency cooperation, and insufficient cross-border and regional cooperation and information sharing.

Divergent procedures that keep changing on a constant basis are considered to be a concern partly because information is not shared on a regular basis with the business community and

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[5] *Source: World Bank Study on Middle East and North Africa, 1995*

[6] *Source: Transport and trade facilitation issues in the CIS 7, Kazakhstan and Turkmenistan, Eva Molnar & Lauri Ojala, World Bank, January 2003*

partly because these also invite divergent interpretation and application when the truck arrives at the border. An overwhelming concern for the peripheral countries is getting access to the road transport market, as well as to transit rights of the other countries. Bilateral agreements cannot keep pace with the changing demand and the strict application of reciprocity is not favoring the countries on the Arabian peninsula. The restriction of the permit quotas, particularly that of the transit permits, is a broadly shared impediment for them all. The lack of containers is only the physical sign of the problem, while the lack of common through-tariffs for container traffic constitutes to the major institutional barrier to its wider application.

Application of road and maritime transportation costs

Road-transport reference costs are stated in Annex 1. These costs have been distinguished between fixed (time) costs and variable (distance) costs. Both cost types need to be calculated differently: fixed costs on a per-hour, and variable costs on a per-kilometer basis. On contrast, Cornell based the maritime transportation costs entirely on the daily vessel costs. As a consequence, this analysis is able to compare true road with true maritime transportation costs.

Cornell applied above reference costs to Yemen's various road categories, difficulties and conditions. The analysis thereby distinguished between the different truck categories (2-axle truck, 3-axle truck, trailer). Based on the finding of the Phase II – Traffic Demand Projections Report, that cargo is imported directly to the centers of consumption (little cargo is moved on entirely domestic routes), Cornell could apply the truck categories directly to import cargo types. Hence, containers and neo-bulk are generally hauled on trailers, dry-bulk cargo is carried on 3-axle trucks, whereas 2-axle trucks are employed primarily for bagged cargo.

Fixed road transportation costs

Driving speed constitutes the most important element to vary time-based fixed transport costs, the most important ones being truck depreciation, driver's wage and accommodation, insurance and general charges. Cornell took driving speeds indicated in Annex 1 as basis for calculating these fixed road transport costs:

Exhibit 7: Impact of various Roads on fixed Costs of different Truck Categories (US$/vehicle/km)

Road Category	2x2 National Road		2x 1 National Road		Secondary Road		Feeder Road	
Truck Category	Easy	Difficult	Easy	Difficult	Easy	Difficult	Easy	Difficult
2-Axle Truck	0.00	0.11	0.09	0.22	0.27	0.51	0.54	0.92
3-Axle Truck	0.00	0.13	0.11	0.27	0.35	0.59	0.69	1.27
Trailer	0.00	0.23	0.10	0.38	0.42	0.86	1.05	2.13

Source: Cornell calculations

From above exhibit it becomes apparent that difficult roads have a serious negative impact on trucking in that fixed transportation costs more than double on difficult road sections. However, fixed costs on the lowest road category (feeder roads) are almost tenfold compared to those on the highest road category (national roads) particularly for heavy trucks such as trailers.

Variable road transportation costs

In order to arrive at a single key figure, Cornell transferred these time costs into distance costs – this was made possible because the time aspect is already built into the variable costs varied by the different road categories, difficulties and conditions. Following exhibit depicts resulting variable costs calculated on a per kilometer basis.

Exhibit 8: Impact of various Roads on variable Costs of different Truck Categories (US$/vehicle/km)

Road Category	2x2 National Road		2x 1 National Road		Secondary Road		Feeder Road	
Truck Category	Easy	Difficult	Easy	Difficult	Easy	Difficult	Easy	Difficult
2-Axle Truck	0.49	0.54	0.52	0.57	0.59	0.71	0.74	0.89
3-Axle Truck	0.54	0.60	0.58	0.64	0.66	0.72	0.82	0.99
Trailer	0.68	0.82	0.68	0.82	0.78	0.93	1.12	1.34

Source: Cornell calculations

In contrast to fixed transportation costs, variable costs increase by just 10% to 20% on difficult road sections. Still, variable transportation costs on the lowest road category are almost double compared to those on the highest road category.

To calculate a transportation cost per ton, Cornell applied truck capacities rather than the truck loading factors as laid out in its Phase II – Traffic Demand Projections Report. This was done to calculate true transportation costs over a long-term projection without a potential interference from stricter law enforcement.

Total road transportation costs

Based on the reference costs as laid out above and in Annex 1, for the year 2008 Cornell arrived at the following road transportation costs:

Exhibit 9: Impact of various Roads on total Costs of different Truck Categories (US cent/ton/km)

Road Category	2x2 National Road		2x 1 National Road		Secondary Road		Feeder Road	
Truck Category	Easy	Difficult	Easy	Difficult	Easy	Difficult	Easy	Difficult
2-Axle Truck	4.4	5.1	5.0	5.8	6.2	7.8	8.0	10.5
3-Axle Truck	4.2	4.9	4.8	5.7	6.1	7.5	8.0	11.2
Trailer	3.7	4.6	4.1	5.2	5.4	7.2	7.9	12.2

Source: Cornell calculations

Both distance and time costs taken into account, the cheapest corridors are 2*x*2-lane national roads. The highest total reference cost is incurred on feeder roads. Cost advantage of a trailer reverses in difficult terrain, particularly on feeder roads the smaller 2-axle and 3-axle trucks can carry loads cheaper compared to the large trailers.

Containers: During 2008, almost 50% of containerized imports through Aden Port were transported in 20' boxes. This proportion was only slightly higher for imports through the port of Hodeidah. Following analysis therefore assumed a proportion of 50% of 20' boxes, to decrease to 40% by the year 2028 (a conservative assumption based on the year 2006 imports). Both 20' and 40' container boxes are generally hauled on trailers.

Breakbulk: In this analysis, 'breakbulk' is defined as neo-bulk (iron & steel and timber) and bagged cargo only. Cornell assumed neo-bulk to be carried by trailers, and bagged cargo by 2-axle trucks only.

Dry bulk: Dry bulk consists mainly of cement & clinker and of wheat. This analysis assumed dry bulk to be carried by 3-axle trucks only.

Maritime transportation costs

Daily vessel costs vary according to ship size. The average size of vessels calling in the Yemeni ports is, however, different for each commercial port. Annex 2 depicts these average vessels sizes taken from Section VI of Cornell's Phase II – Traffic Demand Projections Report. By applying individual steaming times for the various vessel types, Cornell calculated below maritime freight costs per TEU for containers and per ton for dry bulk and breakbulk (neo-bulk and bagged cargo). These shipping costs express the costs to steam the distances on the sea routes between Yemen's three major commercial ports. Consequently,

these shipping costs represent additional costs for cargo not being discharged at Yemen's commercial port nearest to its overseas load center (Mukalla Port for cargo arriving through the Gulf of Aden, Hodeidah Port for cargo arriving through the Red Sea).

Exhibit 10: Transportation-Cost Differences by Cargo Unit between major commercial Ports (US$)

Ship Category	Container (TEU)			Dry Bulk (ton)			Breakbulk (ton)		
Ship Size (GRT)	Aden-Hodeidah	Hodeidah-Mukalla	Mukalla-Aden	Aden-Hodeidah	Hodeidah-Mukalla	Mukalla-Aden	Aden-Hodeidah	Hodeidah-Mukalla	Mukalla-Aden
10,000	3.25	7.52	4.27	0.33	0.77	0.44	0.52	1.21	0.69
20,000	2.31	5.36	3.05	0.18	0.41	0.23	0.33	0.75	0.43
30,000	2.44	5.65	3.21	0.13	0.29	0.17			
40,000	2.13	4.94	2.81						
50,000	1.86	4.30	2.44						
60,000	1.81	4.19	2.38						

Note: based on 6-12 months time-charter rates as of October 2008 quoted by Hamburg Index (HIX)
Source: German Shipbroker Association, December 2008; Cornell calculations

Above exhibit shows that shipping a 20'-container from Mukalla to Aden costs an additional US$ 4.27 on a small vessel of 10,000 GRT. Shipping the same container from Aden to Hodeidah costs US$ 3.25, with the shipping costs between Mukalla and Aden being calculated as roughly the sum of the two maritime sections. The same applies to dry and breakbulk cargo, whose additional shipping costs are given on per-ton basis.

Above maritime freight costs decrease at constant prices due to improved economies-of-scale arising from larger vessels expected to call at Yemen's commercial ports during the projection period. As the size of vessels passing through the ports increases:

- the cost of calling at the port is spread across a greater amount of cargo,
- larger ships which are cheaper per cargo unit to operate use the port, and
- the ports can afford to improve their equipment and increase their cargo-handling rate to reduce the time which the ships spend in the port.

Projected directions of maritime trade into Yemen

Following two exhibits give a summary of Annex 3 and indicate the annual import growth rates.

Exhibit 11: Major Cargo Types imported into Yemen via the Gulf of Aden, 2007-2028 (tons '000)

Forecast Period	**Actual**	**Short-Term**			**Medium-Term**			**Long-Term**		
Cargo Type / Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2018**	**2023**	**2028**
Livestock	0.5	0	1	1	1	1	1	1	1	2
Neo-bulk	1,296.7	1,410	1,536	1,677	1,823	1,983	2,166	3,085	4,535	6,884
Bagged	992.4	1,054	1,123	1,196	1,271	1,353	1,441	2,053	3,017	4,580
Bulk dry	1,871.5	2,007	2,159	2,323	2,493	2,679	2,885	4,109	6,039	9,168
Containerized	1,570.0	1,701	1,845	1,992	2,158	2,340	2,527	3,599	5,290	8,030
Disch.via Gulf of Aden	5,731.2	6,173	6,665	7,188	7,746	8,356	9,019	12,847	18,883	28,665

Note: Only on maritime routes through Yemeni commercial ports, excluding crude oil and oil products
Source: CSO Central Statistical Organization, November 2008; The Cornell Group calculations

Maritime trade through the Gulf of Aden (from the south around the Cape and along the African coast, or from the east across the Indian Ocean and through the Arabian Sea) is expected to proportionally increase from 66% (5.7 million tons) of total Yemeni trade during the year 2007 to 70% (28.7 million tons) during 2028. In contrast, the proportion of trade through the Red Sea (from the north through the Suez Canal) is forecast to decrease from 34% (3.0 million tons) in 2007 to 30% (12.6 million tons) in 2028.

Exhibit 12: Major Cargo Types imported into Yemen via the northern Red Sea, 2007-2028 (tons '000)

Forecast Period	Actual	Short-Term			Medium-Term			Long-Term		
Cargo Type / Year	2007	2008	2009	2010	2011	2012	2013	2018	2023	2028
Livestock	69.5	73	78	82	87	92	97	134	191	282
Neo-bulk	482.1	521	564	612	662	715	777	1,073	1,529	2,251
Bagged	68.9	73	77	81	86	91	96	133	190	279
Bulk dry	1,748.5	1,849	1,961	2,078	2,198	2,329	2,469	3,409	4,860	7,157
Containerized	590.7	634	683	731	786	845	905	1,250	1,783	2,625
Discharged via Red Sea	2,959.6	3,150	3,362	3,585	3,818	4,072	4,344	6,000	8,553	12,594

Note: Only on maritime routes through Yemeni commercial ports, excluding crude oil and oil products
Source: CSO Central Statistical Organization, November 2008; The Cornell Group calculations

Cornell therefore expects the locational advantage of the Republic's ports on its Gulf of Aden coast to increase over its commercial ports on the Red Sea coast.

The following section applies these transportation-cost figures to the centers of the present and future population covered by the Republic's individual commercial ports.

Transportation costs to supply the Yemeni population in rural and urban areas

Projected distribution of population growth

Based on the figures underlying the population distribution laid out in Exhibit 14 below, Cornell projected the population growth distributed over the hinterlands of Yemen's three large commercial ports as depicted in below exhibit (please see also Annex 4).

Exhibit 13: Expected Population Growth in present Hinterlands (heads '000)

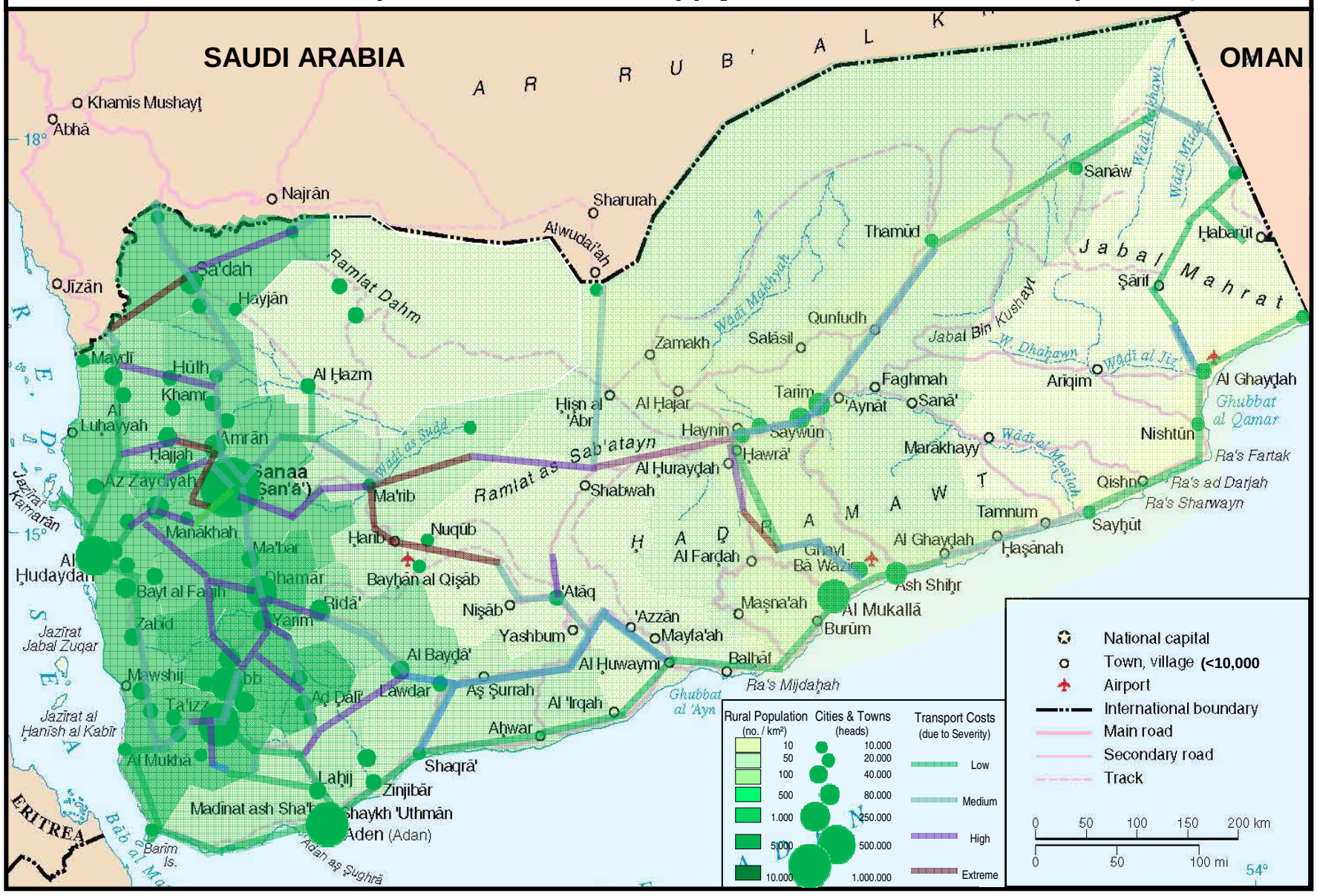
Forecast Period	Short-Term			Medium-Term			Long-Term		
Hinterland / Year	2008	2009	2010	2011	2012	2013	2018	2023	2028
Hodeidah hinterland	AAGR	2.97%	2.95%	2.92%	2.90%	2.88%	2.77%	2.67%	2.56%
Urban Population, of which	3,596	3,776	3,963	4,158	4,361	4,572	5,758	7,183	8,874
Rural Population	8,398	8,574	8,751	8,927	9,104	9,281	10,157	11,006	11,810
Subtotal	11,994	12,350	12,714	13,086	13,466	13,853	15,915	18,189	20,685
Aden hinterland	AAGR	2.88%	2.86%	2.83%	2.81%	2.79%	2.67%	2.56%	2.46%
Urban Population, of which	2,337	2,454	2,576	2,703	2,835	2,972	3,742	4,668	5,768
Rural Population	6,357	6,490	6,624	6,758	6,891	7,025	7,688	8,331	8,940
Subtotal	8,694	8,944	9,200	9,460	9,726	9,997	11,431	13,000	14,707
Mukalla hinterland	AAGR	3.69%	3.67%	3.65%	3.63%	3.61%	3.51%	3.40%	3.29%
Urban Population, of which	499	524	550	577	605	634	799	997	1,231
Rural Population	413	421	430	439	447	456	499	541	580
Subtotal	912	945	980	1,016	1,052	1,090	1,298	1,537	1,812
Total	21,600	22,240	22,894	23,562	24,244	24,941	28,644	32,726	37,204

Note: AAGR = Annual average growth rate
Source: Cornell projections

Considering the trend in comparable countries, where labor migrants eventually settle in their area of employment and have their families follow, population growth can be expected to be strongest in the hinterland of Mukalla, followed by Hodeidah and Aden. This higher population growth in Mukalla's hinterland will result mainly from additional work opportunities in the oil and gas fields of Haudramout. Stronger growth of population in the hinterland of Mukalla is thus expected to also favor the discharge of consumer goods through commercial ports on Yemen's south coast.

The following section applies these transportation-cost figures to the centers of the present and future population covered by the Republic's individual major commercial ports.

Exhibit 14: Road Transportation Costs to supply the Rural and Urban Population, 2008



Traffic coverage of population centers across port hinterlands

Exhibit 14 above depicts the present density and distribution of Yemen's population. Major problems are that

- main population centers are located in the interior mountainous region of the country, thus supply routes are long and difficult;
- sparce population density in the east of the country renders transport investments less economical; and
- centers of population are in a certain distance to large production areas in the neighboring countries, thus rendering overland cross-border transport more expensive.

Accurate actual and projected figures of accumulated numbers of population in larger centers and in minor towns are given in Annex 4.

Transportation-cost advantage of a future port at Dhaba over a location at Burum

A port at Burum could better serve the population of Shabwah governorate to the west of Mukalla, whereas a port at Dhabba would be located better to provide for the population of Hadramout and Maharah goverorates. The population of Mukalla, located between the two potential port sites, could be served by either of them. Cornell drew this sharp distinction in individual hinterlands, because under existing road connections it will prove very difficult to cross the city of Mukalla with medium or even heavy trucks. Below exhibit depicts the present road passing through the bottleneck of the city of Mukalla.

Exhibit 15: National Road around the City and Port of Mukalla / Hadramout Governorate

The population in the hinterland of a port at Burm (governorate of Shabwah plus the town of Baida) totals about 540,000 heads, in the hinterland of a port at Dhabba (governorates of Hadramout and Maharah) the population is almost double that at 970,000 heads (not including the city of Mukalla). Also, population and industries in Shabwah governorate could also be supplied through the port of Aden, while this possibility does not exist for the Republic's region to the east of Mukalla.

Looked at the cost aspect, construction of a road bypassing the city of Mukalla (below exhibit depicts a minimum and not an optimum solution) is expected to be on the expensive site. However, Cornell has not received any cost estimates and therefore not further considered the cost aspect.

Exhibit 16: By-Pass of minimal Length to divert Traffic around Mukalla Central Area

Source: Mukalla: Gateway to the Hadramout – Local Economic Development Strategy, Mukalla 2008

Consequently, looked at strictly under the aspect of road-transportation costs the benefits of establishing a port at the Dhabba site would reap almost double the benefits compared to a port location at Burum.

III. Results and Recommendations

The results in this section have to reflect the large amount of aggregated data. Recommendations are consequently general in nature, for instance, Cornell did not give any recommendations as to specific transport links between particular ports and centers of consumption.

Comparative transportation-cost advantages of individual major commercial ports

Following exhibit depicts the comparison of transportation costs (road costs correlated with shipping costs) for all cargoes imported into the Republic of Yemen during the year 2008 and projected for the year 2028. Since cost savings and additional costs have all been accumulated and therefore widely eliminate each other in the summation, the resulting cost savings appear to be rather small.

Exhibit 17: Savings in Transportation Costs for imported Cargo, compared among major commercial Ports, 2008 and 2028 (% of US$/ton) - nationwide

Port / Year	Aden over Hodeidah		Hodeidah over Mukalla		Aden over Mukalla	
Cargo Type	2008	2028	2008	2028	2008	2028
Container	0.22	0.48	1.45	2.49	1.16	2.02
Dry Bulk	0.18	0.48	5.79	9.65	2.00	3.47
Neo-Bulk	0.16	0.36	2.70	4.51	0.93	1.61
Bagged Cargo	0.13	0.28	1.63	2.71	0.56	0.98

Source: Cornell calculations

Thus, transporting all imported dry-bulk cargoes through the port of Hodeidah would offer a cost advantage of almost 10% compared to discharging these cargoes in the port of Mukalla.

This cost advantage amounts to just 0.2% if all containers were landed in Aden compared to Hodeidah port. Finally, the transport-cost disadvantage would be lowest for discharging all bagged cargoes through the port of Mukalla.

Following solutions can be drawn from above comparison of savings in transportation costs:

- Aden is the best port location among Yemen's three major commercial ports. This statement concerns only transportation costs, thus under the assumption of all other costs being equal (*ceteris paribus*).
- This transport-cost advantage of Aden Port exists for all cargo types, but is highest for containers (and lowest for bagged cargo). The comparative cost advantage of importing containers through the port will increase over the projection period.
- The transport-cost advantage of the port of Aden over Hodeidah will increase over the projection period due to shorter shipping distances, with an increasing proportion of cargo volumes expected to be imported from South Asia and the Far East.
- The transport-cost advantage of the port of Hodeidah over Mukalla, although high for all cargo types, is highest for dry bulk due to the cargoes sensitivity to transport costs.
- The port of Aden has a stronger transport-cost advantage over Mukalla than over Hodeidah, again its advantage is highest for dry bulk due to its transport-cost sensitivity.

Savings in transportation costs would appear much larger if the cargo was imported only through the ports for those areas which have the highest cost advantage (hence their catchment areas):

Exhibit 18: Savings in Transportation Costs for imported Cargo, compared among major commercial Ports, 2008 and 2028 (% of US$/ton) - areas with cost advantage only

Port / Year	Aden over Hodeidah		Hodeidah over Mukalla		Aden over Mukalla	
Cargo Type	2008	2028	2008	2028	2008	2028
Container	2.70	5.07	6.22	10.87	5.82	10.96
Dry Bulk	2.21	4.16	5.11	8.92	4.52	8.28
Neo-Bulk	4.58	8.56	10.15	17.66	9.59	18.08
Bagged Cargo	1.29	2.43	2.98	5.19	2.78	5.21

Source: Cornell calculations

As a result, an average of 8% to 10% in transportation costs could be saved overall. Over the projection period, the present advantage of the port of Hodeidah over Mukalla compared to Aden over Mukalla would disappear with all cargo types except dry bulk. From an economic perspective, the government of the Republic of Yemen should select the ports with the highest cost-savings potential as best location for investment into handling facilities of specific cargo types. Therefore, Cornell recommends to further analyze the feasibility to establish

- container and neo-bulk handling facilities in the port of Aden,
- dry-bulk and bagged-cargo handling facilities in the port of Hodeidah,
- bagged-cargo handling facilities alternatively in the port of Mukalla (or its successor port on the Hadramout coast).

Optimum hinterland areas of Yemen major commercial ports

Since the three commercial ports already exist and all play an important role in providing for their respective hinterlands, Cornell laid out their optimum catchment areas.

At present, cargo discharged in Hodeidah Port is distributed among the densely populated areas of Hodeidah, Sa'adah, Al Mahweet and Amran, whereas the Port of Aden caters for cargo imports distributed among the agglomeration areas of Taizz and Al Daleh. Both ports

share in the provision of cargo to the densely populated regions of Sana'a, Dhamar and Ibb. The Port of Mukalla provides an exclusive import node for the (with the exception of Wadi Hadramout) sparely populated region to the north and east of this city.

Exhibit 6 in the previous section also lays out the hinterlands of Yemen's three major commercial ports, however, considering only transport-cost advantages and no other costs of vessel handling and cargo logistics in the ports (*ceteris paribus*).

The port of Aden is expected to progressively expand its hinterland beyond the city of Sana'a in line with the completion of sections of the super highway planned to connect the two cities by the year 2015. Similarly, after finalization of the southern coastal road Hodeidah Port will gain hinterland not only south of Mokha, but also in the western Taizz governorate due to faster access since the new road connection will be less restricted from urban car and pedestrian traffic.

Freight rate setting based on true road transportation costs

As Cornell stated in the above methodology of this section, freight and insurance charges can only give a – vastly incorrect – approximation of true transport costs.

In November 2008, the Ministry of Transport quoted Cornell following trucking charges (full container out, empty return trip):

- Aden – Sana'a: TEU YR 80,000; FEU YR 95,000
- Aden – Taizz or Ibb: TEU YR 45,000; FEU YR 55,000
- Aden – Mukalla: TEU YR 100,000; FEU YR 120,000

These freight rates compare with transportation costs, as above calculated, as follows:

Exhibit 19: Comparison of selected Road Freight Rates with true Transport Costs, 2008 (FEU, US$)

Aden to destination:	Taizz	Ibb	Mukalla	Sana'a
Freight rate	275	275	600	475
True transport cost	156	258	635	477
Proportion	176%	106%	94%	100%

Source: Ministry of Transport, Aden Branch, November 2008

Considering that transportation costs do not include an element of profit, above quoted freight rates for at least medium and long-range distance appear to be too low. Cornell is convinced that this low freight rate goes to the detriment of proper truck maintenance and could under no circumstances be maintained under unsubsidized diesel prices. At last, as soon as the truck returns empty to Aden[7], meaning not receiving a freight payment (95% of Yemen's international trade consists of imports, backhaul of empty boxes is not charges extra), similar freight rates will result in the depletion through attrition of the company's rolling stock.

Cornell recommends to base present and future road freight rates on detailed calculations of true road transport costs.

[7] *About 20% of containers are unstuffed in the Port of Aden; the rest goes to consignees, is unstuffed there and the containers return empty to the port*