Prioritization of Dry Ports by Using Pair Comparison Technique to Enhance AHP

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Abstract

The present study, with the title of dry ports acquisition using AHP multi-variant decision-making techniques, aims to apply 5 criteria: proper access to rail and road ways near the international airports and the domestic consumption industries, proper climate conditions and near the political institutions to prioritize the construction of the dry ports in the Islamic Republic of Iran among 6 zones: Special Economic Zone of Salafchegan (Qom city), Special Economic Zone of Sarakhs (Sarakhs city), Mehriz city (Yazd province), Talayedarane Qadir Zangan (Zanjan), Aprin Group (Eslamshahr), Arvand Free Area Organization (Khoozestan), Pishgaman-e-Yazd Group (Kowsar), Dry Port Construction Plan between Tehran and Alborz provinces to construct these ports. According to site acquisition researches and the practitioners' and experts' opinions in the context of transportation (aerial, road, marine), the investors, who tend to invest on these infrastructures, are identified and the experts' opinions are applied in this project. Unfortunately, there has been no serious work on this issue and its significance and value is unknown. Although the Islamic Republic of Iran has the status of main way, particularly in Middle East, the logistic status to respond the modern transportation has not been formed properly, e.g. dry ports to decentralize the ports and accelerate the cargo transportation, etc.

Keywords: *dry ports, Scapa, Traszka Corridor*

1. Introduction

Dry port is a multi-terminal at shores directly connected to one or many shore ports. The necessary and sufficient equipments to confront many transportation ways are considered, i.e. road, rail, and aerial and the customers may deliver or receive their goods by these ways (Johan Woxenius,2004).

UN has another definition of dry port in 1982, "a landed terminal with import and export bill of ladings for shipment companies with complete responsibility of costs and conditions", as another definition of dry port comes, "the dry port is a domestic multi-terminal directly connected to one or many shore ports and its bark has many facilities, e.g. customs control (Geneva, 1991). According to Roseau and Loiko use the term "dry port" for the inland terminal that has three assumptions: the direct connection with a shore port, transportation lines with high capacity, and accessibility to the services at shore port. In fact, the proper site acquisition for project implementation is the major part of this process (Johan Woxenius, 2004).

These site and areas have major role in the economic growth of the free economic zones. Meanwhile, some area are more suitable to implement the projects, but the concern is which area is the best suitable? In order to rank and prioritize the site acquisition, it should be noted that usually the decision-makers consider some criteria or indices, if these criteria are quantitative and applicable in numeric form, various math and quantitative methods can be used, but if these criteria and limits are qualitative, math and quantitative methods cannot be easily used, so particular methods are necessary. The hierarchical analysis turns complex problems to simplified form and used in management works. Generally, the problem solving takes the graphical interface of the hierarchy by AHP and then the rate of the related element is compared at higher level in pairs and their weight is calculated and eventually the priorities are evaluated and determined to find the system compatibility.

The major concern in the dry ports: "the balance between the transportation flows at the cargo origin and destination" (Roso Violeta & Others, 2006).

Statistics: According to the studies in many countries, the total logistic costs in every country, on average 62% belongs to the transportation sector, 34% belongs to the inventory and housing, and 4% belongs to the logistics management. However, the logistics management contribution seems small in relation to the total logistic costs, this sector is effective on the logistic pioneer and the cost reduction. In other words, the logistics management needs the least cost share compared to the total logistic costs that is economic and most rewarding. Among the transportation models, the sea shipment has the highest share of the cargo freight. In regard of the container shipment, the integration role of the transportation system is more prominent and the cargoshipment in many modes is more definite. As the European Commission predicts the shipment volume in the European banks has doubled during 2000-2010. The containers block the shore ports, the traffic nodes occur in port banks, and time and money are wasted, which are the problems, when container shipments increase. The port management responds the ever-increasing container shipments and the higher port capacity relies on wider landed areas at the rear of the ports to build container stores. Also the containers blockage cause many problems, e.g. the decreased capacity of the ports, improper services to the customers, the lower performance of the ports, and finally the more shipment costs (Violeta Roso, 2009).

The prevention of the container blockage in the shore ports and the optimal use the more expensive lands to build primary industries, e.g. steel and aluminum factories instead of building stocks to keep goods that is the advantage of the dry ports. Therefore, the multi-shipments is a priority throughout the world to solve the shipment problems. The dry ports are in the port banks as a node to connect the various modes and enhance the performance of the shore ports. The dry port prevents traffic nodes and the various goods are shipped in a normal shipment terminal. In most countries like USA, Spain, Germany, Netherlands, Brazil, South Korea, and India, the facilities are built in banks and railways to reduce port problems. Although the concern has been the length and depth increase of the ports, the area development has been less challenging. Iran has enough capacities, thus just one network is necessary to synchronously use the infrastructures of port, rail, road, and dry ports. The multi-terminal dry ports are connected to the shore ports at sea banks. The necessary and enough equipments are used to solve many shipment travels, including road, rail, and aerial, and the customers can deliver or receive their goods by these methods (Violeta Roso & Johan Woxenius, 2006).

The significant growth of the giant ships that ship the containers should increase the goods volumes significantly at ports and therefore it causes heavy traffics at ports and the final routes of the ports and it

has also reduced the space to discharge, load, and store the containers. The development of the factories, the new industries, and the higher supply and demand rate in the sea shipment have developed the ports and the shipment routes at ports, which would also increase the goods traffics and reduce the space and therefore the renovation of the ports and access structures to the banks is necessary.

According to the studies, a modern ideal terminal has proper physical qualities to provide various services based on its physical qualities. The physical qualities of a modern terminal may be assessed in many circumstances depending on the land value, vicinity to the main production and manufacture centers, place compared to the railway infrastructures as well as the accessibility to the highway networks. This point of view is general and the strategic development of the multi-terminals makes the new notion of the "dry port."

2. Research Background

The discussion of the dry port is a new discipline in the works that is under the focus of the officials in Iran. Although Iran has no active dry port,

The customs throughout the country and the Aprin construction in the past 40 yearshas the idea to reduce the shore ports for long time. Wang and Wei introduced a new method to evaluate the site acquisition of the dry port. They have analyzed the effective factors on the dry port facilities and this modeling is based on the feedback and the relation between the factors. The writers have sued ANP and index system factors in the site of the dry port at Tianjin port in China (Wang, Ch & Wei, x.y.2008). Rang Sheng and Lv have analyzed the Tianjin port in the network process which uses ANP method to determine the priorities of the site acquisition properties (Lv, Rs & Li C, 2009).

Wang et al. have used a method to optimize the siteacquisition of the dry port. They used Fuzzy Clustering method for the western banks of Street Port, Taiwan. After the shipment economy researches, at first the effective factors on the dry port are collected. Then the Fuzzy Clustering method is used to find and prioritize the potential sites and finally three categories arose that needed a different construction strategy and the findings of Wang are useful to develop the dry ports and shore ports (Wang, Y. Wing, J, 2010).

However, theindustrial structure of the sea shipment has changed subject to the more on board containers and multi shipments. The following cases are called the trading factors. The container form platforms, door to door shipping by one bill of lading, irregular shipment market, multi dimensional integration of shipment market, economic globalization, and higher demand of production industries. Certainly, the site capability must be increased to respond the market demand, while the shore ports are the most expensive land consuming spaces in metropolises and their growth without research would cause environmental and land use irregularities. Today the main challenges at the shore ports cause higher container shipment, less space at shore terminals, and higher aggregation at terminal routes. The use of the dry ports can increase the capacity of the shore ports at banks. In most ports, the weakest shipment cycle in banks, so that the improper aggregate roads or railways cause delay or higher shipment costs. According to the idea of the experts, the solution is the railway or domestic multi terminals in the shore ports (Violeta Roso & Kent Lumsden, 2009).

Fig 1 shows the traditional transition method in a port, as the cargo rail transit is only possible for city to port transits and the cargo transit to other manufacture and goods collection area relies on road access.

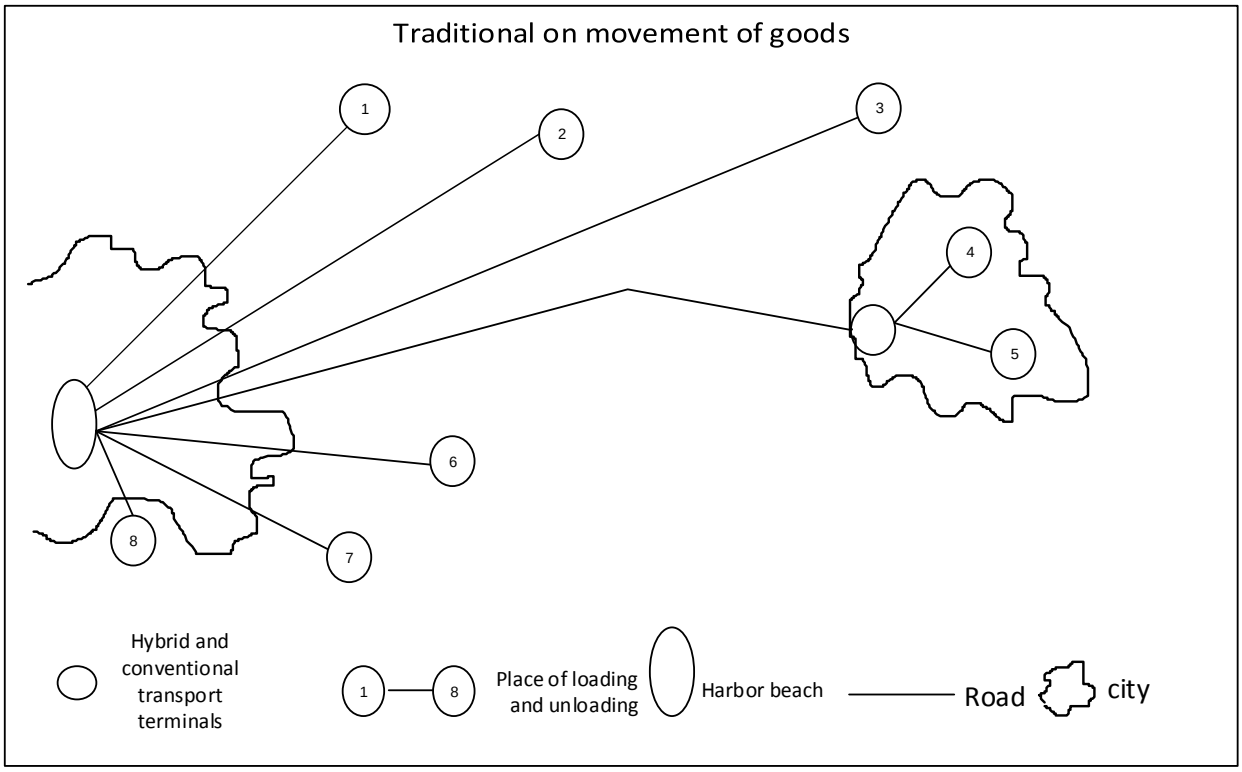

Fig 1. Traditional cargo transit method

The dry port for the container shipment development is so important that one could claim that if the dry port does not exist, the country cannot have the complete advantage of the containers in spite of its costs. The presence of the dry port isperquisite for railway success, so that the container shipment would be overburden in short term and the market would not resist on long term due to its uneconomic condition (though aversion container is established to transit container among present rail carriers). The reason is that the dry port has the aggregate shipment conditions by the dense market of the container services in the countries to make the railway container transit services possible. Certainly, it could be said that the railway container transit development needs to construct and develop the dry ports and almost all countries owe their railway container transit development to the dry ports.

Fig 2 shows the priority of the dry port in the cargo shipment cycle.

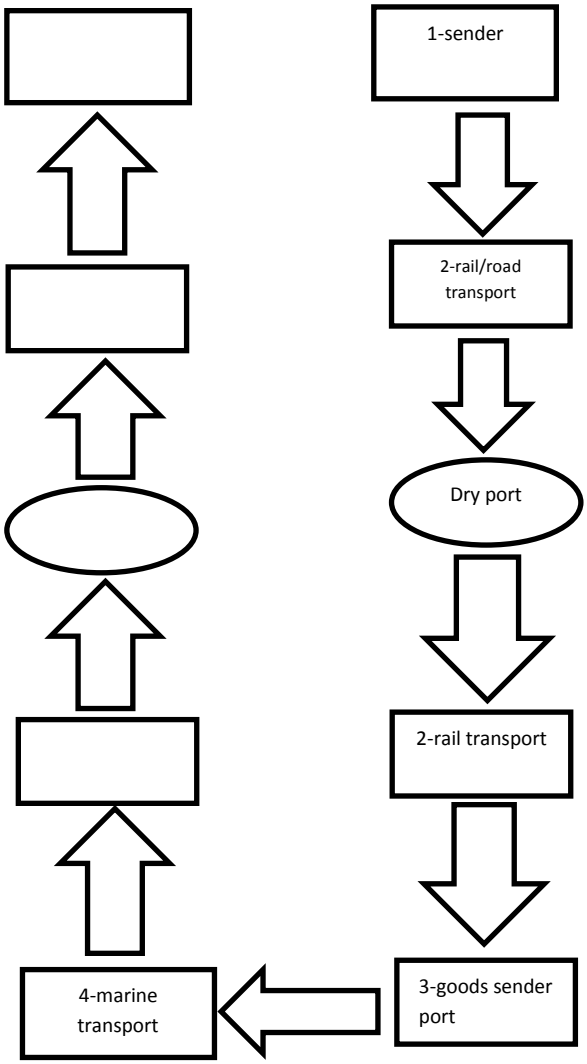

Fig 2.The priority of the dry port in the cargo shipment cycle

3. Types of Dry Port:

Off-shore dry port

This type is the most regular dry port with the long history. The most important reason to implement is the distance and cargo flow rate built for railway or river shipment after the economic evaluations, as compared to the traditional railway to or from ports, which is majorly related to the provided services in these ports in the field of the customs and the reduction of the direct access of the roads to the shore, so that the final routes to the shore ports are reduced (Fig 3).

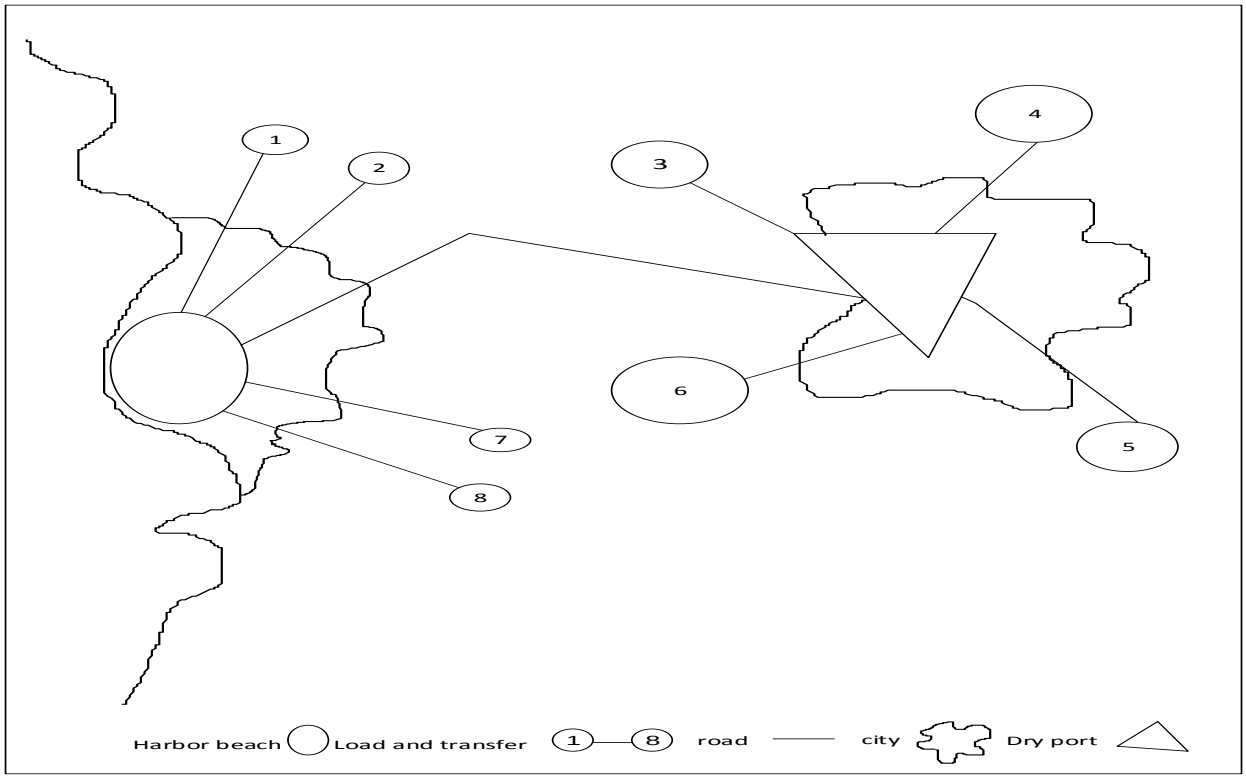

Fig 3.Off-shore dry port

Average distance off-shore dry port: This type of the dry port is placed at a determined distance from shore and can be accessed through roads within manufacture and collection points. This type of the dry port is the confluence of the railway services and has the office and technical duties (e.g. the x-ray scanners to inspect at customs, Fig 4).

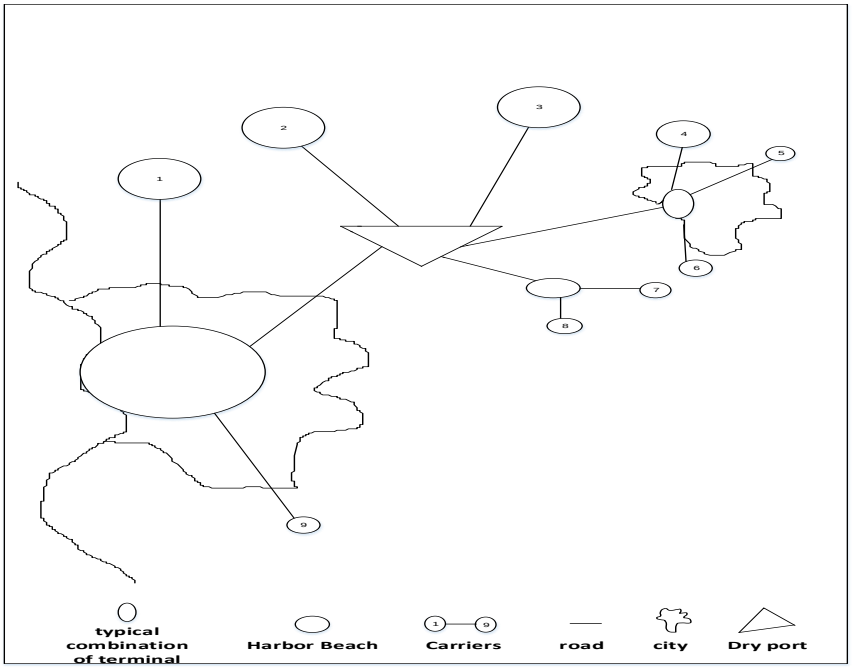

Fig 4. Average distance off-shore dry port

Another instance of these ports is the Dry Port of Virginia that is the confluence of both railway and road transits to deliver the goods containers to the Port of Virginia Beach. This dry port is located at the 350km distance from beach and offers all kinds of the customs services. According to the extension of the containers in the sea shipping, the most important problems in the shore ports include the insufficient inner space and improper access to the goods manufacture and collection points. In order to increase the capacity in the shore ports for such demand levels, the dry port is constructed in vicinity of the coast or the coastal suburban. As the capacity of the port increases, more rapid services are provided and therefore the big container ships refer to the port (Fig 5).

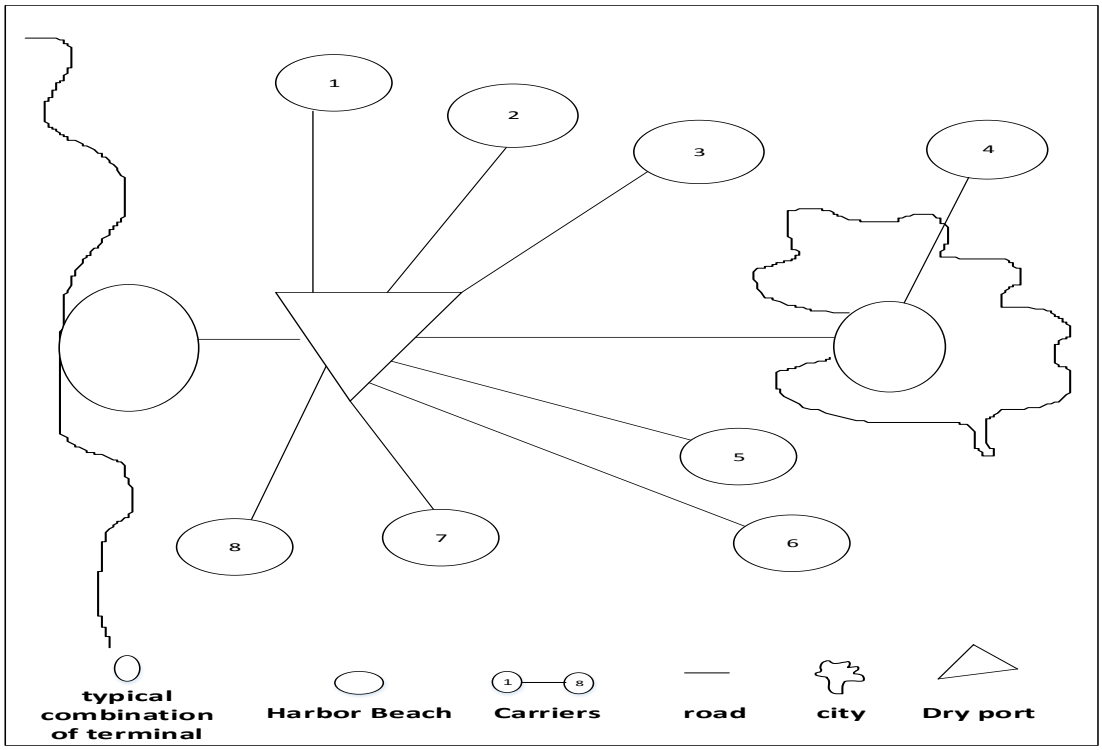

Fig 5. Dry Port near Geneva, 1991

The reduction of the environmental effects in the shore ports and sea and the special goods (dangerous, glacier, and heavy), the reduction of the air pollution, the reduction of the store activities, and the facilitation of the shipment are the advantages of this dry port.

4. Research Statistical Analysis

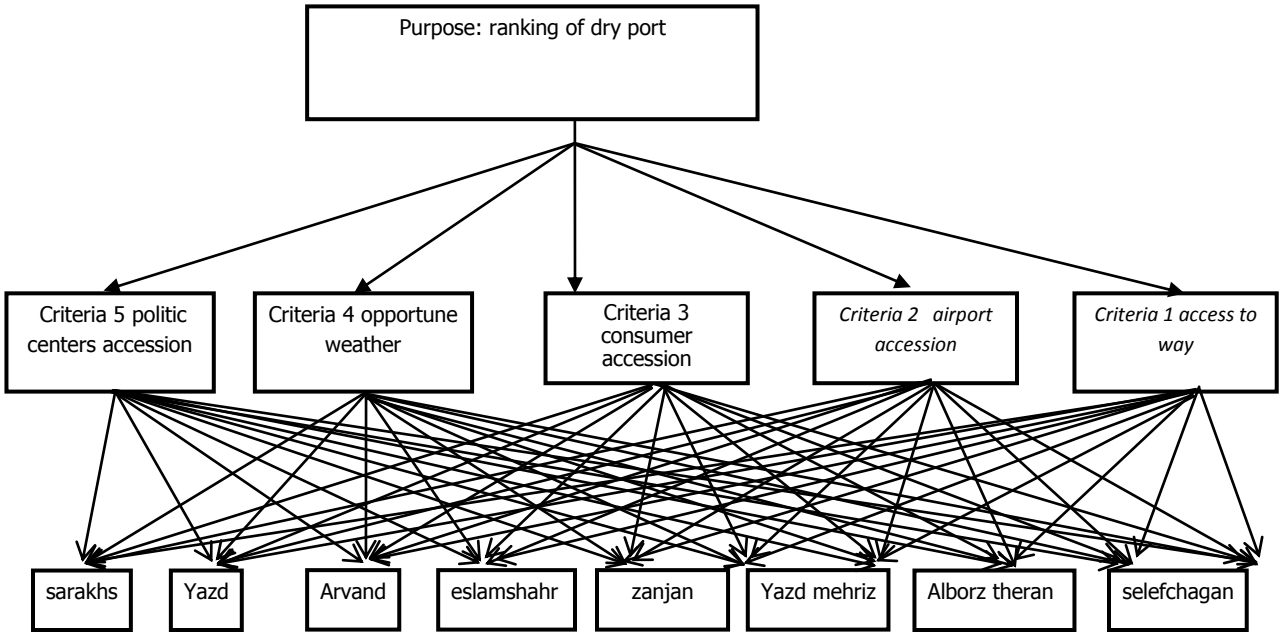

Diagram 1. The conceptual model of the research

The Salafchegan Special Economic Zone: This zone is located at 40km distance from Qom city at the confluence of Qom-Saveh-Arak-Delijan-Isfahan Roads and the main north to south highway in the west of the country at 100m distance of Salafchegan city. The acquired time to reach Imam Khomeini Airport is one hour at this location, while the Tehran-Qom Railway is present. The distance of the Salafchegan Special Economic Zone to Tehran is 185km, as in proximity of the political, economical, and trading centers of the country by 60% of the main industries of the country at 230 km of this zone near the great industrial, manufacturing, and consuming cities, as Tehran, Isfahan, Arak, Saveh, and Qom, while the issue of no licensing within 120 km distance of Tehran for industrial construction has increased the investors' interest to invest in this zone, which is one of the most important advantages of this zone.

Sarakhs Special Economic Zone (Sarakhs city): Sarakhs Special Economic Zone is located at the north extremity of Iran at Khorasan-e-Razavi Province (O61 10' eastern longitude and O36 32ó latitude with 235 m altitude) and 150km eastern distance of Mashad city and 15 km distance of Sarakhs city and conterminous to Turkmenistan at east and north. The distance of Sarakhs city to the entrance/exit and the domestic important trading ports is accessible through the decuple routes of the middle east countries at south, south-west, west, north and on counter the decuple routes can be used whose distances are presented in the following table.

Row	Route	Distance (km)
1	Sarakhs-Mashad-Birjand-Zahedan-Chabahar	1875
2	Sarakhs-Mashad-Birjand-Zahedan-Bam-BandarAbbas	1883
3	Sarakhs-Mashad-Gonabad-Deihook-Kerman-BandarAbbas	1580
4	Sarakhs-Mashad-Gonabad-Tabas-Yazd-Sirjan-BandarAbbas	1678
5	Sarakhs-Mashad-Tehran-Qom-Kashan-Yazd-Sirjan-BandarAbbas	2274
6	Sarakhs-Mashad-Tehran-Qom-Isfahan-Shiraz- Boushehr	2265
7	Sarakhs-Mashad-Tehran-Qom-Arak-Ahvaz-BandarEmam	2129
8	Sarakhs-Mashad-Tehran-Qazvin-Zanjan-Tabriz-Bazargan	1944
9	Sarakhs-Mashad-Gorgan-Noshahr-Rasht-Anzali-Astara	1435
10	Sarakhs-Mashad-Tehran-Qazvin-Hamedan-Kermanshah-Khosravi	1804

Mehriz County (in Yazd Province): Mehriz County is restricted to ShahrBabak and Anar counties of Kerman province and Khatam city at north and Taft city at west and Bafgh at east. The center of this city is Mehriz County located at 35 km distance of Yazd city.

Arvand Free Industrial Trading Zone: It is located at North West of KhalijeFars and south west of Khouzestan province with the extent of 173 km^2 at the confluence of ArvandRood and Karoon with the conterminous border Iraq and Kuwait.

Eslamshahr Aprin Group: Eslamshahr is the center of Eslamshahr County located at Tehran province in 12 km distance of south Tehran and accessible by the old and new Tehran-Saveh highways and also Azadegan and Ahmadabad Mostowfi highways. Its distance to the center of Tehran is about 15 km. The most ancient areas of Eslamshahr are Saloor, Mafinabad, and Zia-Abad County as placed in the main way to other countries. The extent of the country is about 245 km^2 with little difference compared to the center of Tehran at 51 degree and 10 minutes of the north longitude 30,22,51 and the east latitude 30,27,35-30,42,34 from prime meridian that has 2 sections, 4 rural districts, and 49 counties.

Talayehdarane Ghadire Zanjan: It is one of the provinces in North West of Iran as a district where Azerbaijani people live. The center of this province is Zanjan city. Zanjan province has 8 counties and 1210 rural districts of which 978 rural districts are inhabited and the others are uninhabited.

The pair comparison is used to enhance the AHP results, the primary priority is the dry port construction at the distance between Tehran and Alborz Provinces, the second priority is Salafchegan Special Economic Zone, the third priority is Arvand Free Zone (Khouzestan), the fourth priority is Eslamshahr Aprin Group, the fifth priority is Mehriz county (in Yazd Province), the sixth priority is Sarakhs Special Economic Zone, the seventh priority is Pishgamane Yazd Group (Kowsar), the eight priority is Talayehdarane Ghadire Zangan (Zanjan).

5. Conclusion

Almost most researches and the final adjustments to construct the dry port have found the new schemes and the most proper site based on the mentioned criteria and the present approaches in the country. The objective of the site acquisition includes those criteria, which I consider the necessary to construct the dry port, however, the practitioners use the hierarchical analysis to prioritize. The dry ports in our country, in spite of the scientific definitions, are the unknown ports that have not found a relevant position. However, the transportation practitioners are not very acquainted with the dry port, some experts tend to construct and implement these zones.

The universal experiments and the national studies conclude that if the dry ports are activated by financial support, they will certainly be effective to enhance the transportation system and domestic transit development. According to the criteria of this research, the dry port plan of Tehran-Alborz is at the first priority, as we conclude that some parameters, i.e. proximity to railways, roads, international airports, suitable weather, proximity to the political centers (Tehran), all influence the construction of these dry ports that are more appreciated compared to the competitors. Salafchegan Special Economic Zone has much potential, such as proximity to Tehran (Capital City), proximity to Qom (tourism and pilgrimage), Abrisham Road, proximity to consumers in Tehran and Qom and goods storing, etc. which have arisen the second rank for this zone. Another studied zone in this research is Sarakhs that has the major geographical position among the members of ECO and also it has the strategic and geographical position to route the middle east countries and the vast territory of China and Russia and a route for the major trading centers in middle east and the surrounding countries of the Persian Gulf in south of Iran, as Europe is located in west of the Islamic Homeland and Afghanistan and Pakistan are in east of the Islamic Republic of Iran. This zone will be one of the active dry zones having such properties in the sixth rank, even the superior position of Yazd in the transportation corridors of Iran has highstandard in the navy and aviation operations in Yazd airport as the exceptional confluence site of the 5 domestic railways that is ranked in the seventh position compared to the other competitors in this research.

All of these conditions depict the very logistic and particular position of the Islamic Republic of Iran, related to the other regions, i.e. Yazd, Sarakhs, Zanjan, that have these potentials on the dry ports in the inside the borders and the logistic and particular region in the middle east to compete and challenge.

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