

行政院及所屬各機關出國報告

出國類別：八十八年度臺灣省政府公費出國研習運輸規劃管理

服務機關：交通部基隆港務局

出國人職 稱：秘書

姓 名：陳榮聰

出國地區：英國

出國期間：89.9.12 至 90.8.10

報告日期：90.9.24

行政院及所屬各機關出國報告提要 系統識別號：C09005365
出國報告名稱：八十八年度公費出國研習報告書 頁數 84 含附件：是

出國計畫主辦機關/聯絡人/電話
行政院人事行政局中部辦公室/陳彩月/049-2359151 ex 312

出國人員姓名/服務機關/單位/職稱/電話
陳榮聰/交通部基隆港務局/業務組/秘書/02-24208128

出國類別：進修

出國期間：89.9.12 ~ 90.8.10 出國地區：英國

報告日期：90.9.24

分類號/目

關鍵詞：

都市運輸規劃管理 (urban transportation planning and management)、永續性 (sustainable) 與整合性 (integrated) 運輸系統、

內容摘要：(二百至三百字)

一九五七年羅馬條約 (the Treaty of Rome) 的訂定係為歐洲共同運輸政策 (common transport policy) 發展的肇端。而一九九一年的馬斯垂克協定 (the Maastricht Agreement)，又將運輸的角色予以擴展。而歐盟國家在尊重與維護環境的前提下，近年來即以促進一個穩定且非膨脹性的成長，並以永續性與整合性角度考量，期能達成經濟成長、生活品質提升、提高就業與當地發展、及環境維護等目標，而此亦正是現階段國內都市運輸規劃單位應努力的方向之一。再者，本文另綜合臚列倫敦、巴黎、東京與紐約等四大國際都市於運輸規劃組織權責、過程與經費來源等的經驗，或可以他山之石，作為相關單位推動業務之參考。最後另以基隆港市作為案例，探討港埠發展對於臨近市區的經濟、交通運輸、環境與生活品質、就業等之衝擊，並引進一觀念模型 (conceptual model) 且透過比較基隆港與鹿特丹、馬賽、佛里斯多、漢堡等四港，提出基隆港未來發展重點項目，作為基隆港市當局未來決策時納入考量。

本文電子檔已上傳至出國報告資訊網

八十八年度臺灣省政府公費出國研習人員報告書

報告人：基隆港務局 秘書 陳榮聰

中華民國 九十 年 九 月 二十四 日

出國報告書

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一、依據

依「臺灣省政府公費出國研習人員須知」暨臺灣省政府 88.4.14 八八府人三字第 151136 號函發「八十八年度臺灣省政府公費出國研習人員手冊」辦理。

二、研習類科及期間

- (一) 研習類科：都市運輸規劃管理
- (二) 期間：一年，並自 89.9.12 起至 90.9.11 止（提前於 90.8.10 返抵國門）。

三、研習地點及機構

- (一) 研習地點：英國
- (二) 機構或學校：樸里茅斯大學

四、研習計劃

- (一) 主要內容：
 - 1. 英國與歐洲運輸政策
 - 2. 世界主要都市運輸研究
 - 3. 運籌（物流）管理概念與應用
 - 4. 港口都市發展與衝擊
- (二) 觀摩參訪活動：
 - 1. 90.2.28 訪問國際海事組織（IMO）與倫敦港務局（Port of London Authority），藉以瞭解世界發展趨勢。
 - 2. 90.3.1 至 3.2 訪問 Fritze & Co, Hellmann Worldwide 以及 Dagenham Storage 等物流業者吸取實務發展經驗。
 - 3. 參訪期間討論主題包括以下各項：
 - (1) 區域都市規劃策略對於港口發展之影響。
 - (2) 港埠與都市發展的爭議性課題（controversial issues），諸如土地使用、交通與環境等衝擊。
 - (3) 港口都市再開發的策略。
 - (4) 港埠競爭策略。
 - (5) 各物流業者的公司特色與發展策略。
 - (6) 物流業選擇分銷中心（Distribution center）與使用運具的準則與限制。

五、研習經過

(一) 啟程：

於 89.9.12 上午九時搭乘長榮航空 BR67 班機經曼谷後直飛倫敦希斯羅機場 (Heathrow)，於當地時間 9 月 12 日晚間八點到達，並於次 (13) 日於倫敦 Gatwick 機場搭乘英國航空 BA4005 班機直飛樸里茅斯，於當日午後二時三十分抵達。

(二) 新生訓練課程：

為期能儘速學校軟硬體設施與相關環境，俾利日後學習，於 89.9.13 至 9.18 參加樸里茅斯大學辦理之新生訓練課程 (orientation program)，助益匪淺。

(三) 課程起始與研習內容

1. 第一學期 (18/Sep/00~15/Dec/00)

- (1) 完成資料分析、國際物流、航運環境與財務經濟等必修課程，研習情況良好。
- (2) 另閱讀有關都市運輸規劃書籍諸如：'Cityport industrialization and regional development', 'Land-use and transport planning', 'Channel tunnel'; 以及港埠管理叢書如：'Port management and operation', 'Maritime policy and management' 及相關期刊。

2. 第二學期 (8/Jan/01~30/Mar/01)

- (1) 完成路網指派、風險分析、國際物流與港埠管理行銷等課程。
- (2) 研讀書籍包括港灣都市之開發與交通運輸日文版、'Cityports, coastal zones and regional change', 'The four world cities transport study', 'Sustainable urban transport policy', 'Transport 2010/ The 10 years plan of UK'.
- (3) 於 90.2.28 至 90.3.2 前往國際海事組織、倫敦港務局、Frize & Co, Hellmann worldwide 及 Dagenham 參訪。

3. 第三學期迄回國前 (23/April/01~9/August/01)

- (1) 完成 Cityport development and local impacts 論文寫作。
- (2) 研讀運輸、物流管理等相關的國際期刊。

六、具體成果

(一) 歐洲與英國運輸政策部份

基本上，歐洲運輸政策可分為以下階段，各階段之期間與政策重點略述如后¹：

Phase I: 1957—1992

一九五七年羅馬條約 (the Treaty of Rome) 的訂定係為共同政策 (common policy) 發展的肇端。而這個階段中，除上開條約之外，一九九一年的馬斯垂克協定 (the Maastricht Agreement)，又將運輸的角色予以擴展後包括：

- 將國際運輸納入共同政策規定，並注意到運輸安全的改善。
- 闡明歐盟的成立目標—‘在尊重環境的前提下，促進一個穩定且非膨脹性的成長’，同時亦強調以整合性角度考量，達成經濟成長、生活品質、就業與當地發展、及環境維護等目標的重要性。

在歐盟國家的共同運輸政策 (Common Transport Policy; CTP) 白皮書中建議，在一個公開且具競爭性的市場中，透過路網的聯結，設立與開發一個泛歐運輸網路 (Trans-European Transport Networks; TET_n)。而 CTP 的主要目標為：

- 持續加強內部市場 (internal market) 的功能以俾利歐盟間人貨流的運輸活動。
- 由人為的管制障礙 (artificial regulatory obstacles)，轉變為支持歐盟國家發展一貫的整合運輸系統 (coherent integrated) 及正確的均衡發展政策。
- 透過運輸基本設施的開發，減少區域間的懸殊情形，並連結島嶼、內陸與歐盟中心區域週邊各國，進而加強經濟與社會的一貫性。
- 提出方法以確保運輸活動能夠以一種永續性的型態 (sustainable pattern)，且基於尊重環境的立場下發展，譬如對於二氧化碳排放量的限制。
- 採取促進運輸安全的行動。
- 在社會層面上採取適當的方法。

¹ David Banister, Dominic Stead, et, (2000), European Transport Policy and Sustainable Mobility, E & FN Spon, London, pp 57- 72.

- 與第三國間建立起良好關係，促進歐盟整體間的發展。

Phase II : 1995—2000

在此階段間，歐盟在運輸政策著重點上有一個顯著的改變，那就是更強調社會層面一致性的目標、運輸安全、環境保護與加盟國。

- 為改善運輸系統的效率與競爭力，期能執行以下各項：
 - 1.對於鐵路、空運與港埠市場的進入予以自由化。
 - 2.確保整合性運輸，持續發展泛歐網路優先計劃，但引進公有民營的經營籌資系統。
 - 3.確保各運具內、運具間公平且有效率的訂價(fair and efficient pricing)，特別是運用邊際社會成本訂價原則(the principles of marginal social cost pricing)。
 - 4.使更均衡與具永續發展性的政策能夠於歐盟間執行。
- 為因應歐盟人民對於生活品質的需求，必須做到：
 - 1.不論是空運、海運或陸運，運輸安全是政策上永久性的考量項目。
 - 2.運輸活動應該考量氣候變化(climate change)，而以永續性的型式發展。其應包含精密的運輸與環境指標(indicator)之開發，以及加強對於環境衝擊的評估(environmental impact assessment)，諸如航空運輸噪音與排放物、海運廢棄物的收集、重型卡車的問題等。
 - 3.透過對於CTP的參與，保護運輸服務的消費者，並增進服務品質。
- 這個階段的政策項目可以細分為：
 - 1.一九九五年綠皮書(the 1995 Green Paper)選擇將運輸的外部成本(the external costs)(諸如：空氣污染、擁擠、事故與噪音等)予以內部化(internalizing)。
 - 2.為使盟內鐵路系統再現活力，一九九六年的白皮書則提出促進鐵路現代化、整合與使用的策略，並建議歐盟應著重於五大範圍—財務(finance)、市場力(market force)、公共服務(public service)、國內系統的整合(integration of national system)與社會層面(social aspect)。

3. 一九九七年在多運具聯運 (intermodal) 運輸議題中，提出一個能夠提供緊密 (seamless) 且效率 (efficient) 的門及門 (door-to-door) 整合性運輸服務的架構 (framework)。
4. 促進市場的進入 (access) 與提高鐵路及港埠的功能。
5. 加強對於二氧化碳的排放及限制等重要的環境衝擊之評估。
6. 鼓勵會員國加速 TET_n 優先計劃的執行，並鼓勵公私合作的模式 (public-private partnerships; ppps)。
7. 對於內陸水運、空運部門等的作業時間提出建議案，並使運輸與相關政策達成協同合作的功效。
8. 確保各法律規定的執行與變換。
9. 促進各運具的運輸安全。
10. 於 CTP 發展期間，為保護使用者與提高運輸服務品質，必須確保使用者能夠適度參與提供意見及需求。
11. 為了改善當地大眾運輸服務品質，必須檢驗如何修正國內大眾運輸的立法架構。
12. 設定特定的主行動方案 (special key action programme) 來執行許多為達到提升運輸系統的效率與永續性成長的研究計劃。
13. 與中、東歐國家們就航空器、重型卡車、長途巴士、內河運輸等進行協商並訂定協議。

另再針對英國運輸政策而言，一九九八年七月一日英國工黨發表新運輸政策白皮書 (White Paper) — 'A New Deal for Transport'²，該政策所標榜的主要目標是創造一個較佳且具整合性的運輸系統，以解決現存的都市交通擁擠與產生污染等問題，使每個國民生活會更好 (Better for everyone)。有關該國運輸政策的演變，茲回顧如後：

1. 於一九八九年以前
隨著經濟活動的活絡、就業人口及所得的增加、都市的擴展 (例如都市化 (urbanization) 及郊外住宅區的興起 (exurbia))、小汽車的擁有率 (ownership) 與旅次數皆呈現相當比例的成長。以英國倫敦而言，在近二十年內，小汽車

² Department of the Environment, Transport and the Regions, (1998), A new Deal for Transport : Better for Everyone, The Stationary Office, London.

擁有率出現兩倍成長，旅次增加近 50%，其中小汽車所佔旅次數由原來的 1/3 增加至 1/2，同期公車旅次則由佔 1/3 降為 1/6，火車旅次也由原佔 1/6 減少為僅佔 1/10。為因應小汽車旅次的大幅增加，政府當局對於公路及其路網的興建不遺餘力。此時期政策的訂定係為需求導向 (led by demand)，同時亦為一種藉由預測而後提供所需道路容量 (predict-and-provide)³ 的方法。就運輸規劃的發展而言，這種以旅次產生、旅次分佈、運具分配及交通量指派 (trip generation, trip distribution, modal split and traffic assignment) 等四個步驟為基礎的旅次預測模型，係於規劃區域性公路系統所發展而成。模式所佔的角色只是預測未來公路旅次需求，用以決定公路系統的擴建程度。模式的正確性往往因為小汽車使用的急速成長所造成的擁擠程度而遭受忽略。其係依據下列二個基本假設：

- 私人運具所帶動的旅次勢必增加，因此必須增加道路容量。
- 對於公共運具的使用需求會下降，因此降低其服務水準是符合邏輯的。

2. 於一九八九年以後

承上述，儘管道路交通流量確實會因上開各項因素影響而增加。然而，對於各種預測模型所產生旅次預測值的正確性，事實上是值得深思的。因為各都市在既有的道路系統與架構之下，要想根據預測值而發展出適當的道路系統或興建其他道路以增加道路容量因應旅次所需，在實務上是很難辦到的。因此，在一九八九年以後，運輸政策轉而著重於—對於需求的管理，不再偏重於增加道路容量。在這個階段當中，建立起以下幾項運輸政策的發展原則：

- 運輸決策要以一種整合性 (integration) 兼顧均衡 (balance) 的原則看待。例如於國家經濟發展最高水準的政策下，能將長期的土地使用規劃亦當作重要的背景因素納入考量。
- 以同樣的目標原則看待各種運具及其產生的影響，亦即強調在同一立足點上看待各項運具。

³ Phil Goodwin, (1999), Transformation of transport policy in Great Britain, Transportation Research Part A 33, pp 655- 669.

- 對於‘無法滿足潛在交通量需求’的看法趨向一致。
- 體認到——一項成功的運輸政策必須考量到人的因素（human factors）及對於旅次產生者的動機進行瞭解。於是若干研究⁴朝向旅次行為（travel behavior）、居民的機動性與每日機動性（residential mobility and daily mobility）、家庭組成與機動性的型式（household forms and patterns of mobility）、通訊的運輸衝擊、使用人對於公共運輸的感受（user perception of public transport）及都市與道路環境的分類和解讀（categorization and interpretation of urban and road environment）等項目進行研討。
- 必須分別出那些是‘必要’及‘不必要’（essential and non-essential）的交通量。

而另一方面，由於全球的溫室效應（greenhouse effect）、酸雨（acid rain）與環境生態品質每況愈下，亦喚起了世界各國對於地球村環境（environment of global village）的注意。根據相關研究顯示，先進國家當中，由運輸所產生的各項污染源當中，佔所有二氧化硫量（SO₂）的 5%；所有微粒（particle）的 10%；所有碳氫化合物（CH_x）的 50%；所有二氧化氮（NO₂）的 50%及所有一氧化氮（NO）的 80%。既然交通運輸已成為這些污染源快速增加的最重要來源之一，而這些污染又絕大部份係因私人汽車的使用所引起，因此，就歐盟國家而言，乃於一九九 0 年九月的運輸部長會議中一致通過共同遺產——環境白皮書（This Common Inheritance—The Environment White Paper 1990），並發表下列聲明⁵：

- 利用對於車輛的賦稅手段及管制，以達到減少油量消耗及污染排放的目標。
- 利用交通管理（traffic management）方法，對於運輸需求與運具分配進行研究。
- 基於污染者付費原則（the Polluter Pays Principle），對於破壞環境者課徵相關費用。

⁴ Peter Stopher & Martin Lee-Gosselin, (1997), Understanding travel behavior in an era of change, Elsevier Science Ltd, pp 1- 10.

⁵ European Conference of Ministers of Transport, (1990), Transport Policy and the Environment, ECMT/OECD, Paris.

- 於都市中以經濟有效且可接受的方法降低私人車輛的使用。
- 對於基礎設施 (infrastructure) 的投資建設必須包括交通與環境替代方案的評估。

自一九九〇年以來各國重大的 (landmark) 措施諸如：德國於全國各大小都市設置行人專用徒步區 1000 處、史堪地納維亞半島 (Scandinavia) 的道路定價及英國於一九九七年政權交替後重視公共運輸、行人徒步與自行車 (walking and cycling) 的發展。

3. 政策與面臨的問題

儘管英國政府依據上開歐盟國家共識及其國內的若干研究 (諸如由 The Countryside Commission 於一九九二年所完成的 'Trends in transport and the countryside' 顯示出郊區的快速發展；一九九四年出爐的 'The Royal Commission of Environmental Pollution 18th Report 以及 20th Report' 呈現出在運輸上環境的無法維持性 (unsustainability)；一九九四年 SACTRA (Standing Advisory Committee on Trunk Road Assessment) 的 'Trunk Roads and the Generation of Traffic' 則說明道路容量的增加將導致總體交通量的增加；而一九九五年 The RAC 的報告—'Car Dependence' 則促使相關當局支持減低小汽車依賴度的政策，並鼓勵減少小汽車旅次 20%；一九九七年 SACTRA 的 'Transport investment, transport intensity and economic growth' 報告中則闡述運輸投資的正反面經濟衝擊，無法以現有評估方式適當表示；再者，英國環境運輸與區域部 (DETR；Department of the Environment, Transport and the Regions) 與倫敦運輸研究中心 (London Transport Research) 則於一九九八年的 'Traffic Impacts of Highway Capacity Reductions'⁶ 中提出—道路容量可以透過重新分配給行人專用區或其他運輸優先需要而不會引起替代路線的擁擠等等)，發表了促進綠色運具 (green modes；如大眾運輸、徒步與單車推廣) 的運輸政策白皮書，但其實施上仍不免產生若干問題。

⁶ Cairns S., Hass Klan C., Goodwin P., (1998), Traffic impact of highway capacity reductions : assessment of the evidence, Landor, London.

這些問題不外乎為：

(1) 文化面—交通量減少的可行性

- 首先來自於商家的反對—如果減少交通量的作法會降低車輛到達市中心的可及性或與其他都市（甚至於市郊）的競爭力，那麼勢必引起市區商家的極力反對。舉例而言，儘管行人專區於德國發展相當良好，使得商家與整個市區的商業活動都因而獲利，但民眾對於新政策實施成功的信心程度卻是必須納入考量的。
- 其次來自於運輸工程師的反對—一般而言，以往交通工程師會基於全部總交通量固定的假設下，認為某條道路（或區域）的交通量可以轉移到另一條道路（或區域）。但事實上，總交通量會受到道路訂價、速度替代方案之有無...等影響。再者，認為交通量僅受所得影響而不受政策之改變而變動的想法，亦有其系統上的偏差，如此亦將高估新建道路解決擁塞的能力或低估（underestimate）道路空間重新分配可產生的潛在利益。

(2) 組織面—各部會間的合作協調

- 如前所述，運輸政策與土地使用、環境保護、經濟發展等相關部門的政策，彼此間有密切的交互作用（interaction）。然而，各部會中不免有獨特的處事風格與文化，因此，如何建立一個部門間的控制機制（inter-departmental control mechanisms）化解彼此爭議，以達增進效率的目標，是一個相當棘手又是必須面對的議題。

(3) 運輸發展的重視程度與道路容量的再分配—

- 由於過去數十年間對於大眾運輸發展的忽略，有專家建議：大眾運輸市場每年全國應該要有 5% 的成長，並且持續 30 年。而對於交通問題嚴重的大都市來說，上開速度必須高達 50%，並且縮短於二至三年內完成。另一方面，有關公車專用道、高承載車道、保留停車空間以及人行設施等都是現代化都市交通政策必須思考的替代方案。

(4) 財政與政治面—預算編列與經營所有權

- 公營部門差勁的績效促使民營化（privatize）的念頭。一般而言，公營體制之下，資產與投資無法有效發揮其效

用，同時經營成本比民營為高。舉例而言，許多國家國營鐵路的勞工成本超過收入的 75%。而以英國解除管制與民營化為例，其平均每車公里的營運成本下降 30~40%；拉丁美洲將道路維護以合約方式交由民間負責，成本亦減少 25~50%。而另一方面，公營亦無法立即因應市場需求，甚至產生營運虧損而造成財政負擔，亦使公營企業受到質疑⁷。

- 儘管近幾年來，英國鐵路系統因事故頻仍而屢有收歸國家經營 (re-nationalize) 之議，但基本上，自一九八〇年以來，「民營化」仍係英國政府施政的一貫主張，對於大眾運輸的營運亦不例外。為了能夠提供民眾安全、舒適、可依賴的服務，政府當局就必須基於監督之責，要求民營業者負起相關的義務。於是，業者與官方的協商在所難免，而如何尋求一個有品質的民營夥伴 (quality partnerships) 就成為政策白皮書中強調的要項之一。再者，由於公共支出政策的限制，政府支出在運輸上並沒有巨幅增加，地方政府自然會面臨財源短缺的問題。為一次性挹助財源並解決擁擠與環境汙染等問題，專家建議可透過道路訂價 (road pricing) 課予汽車駕駛人或所有運輸使用人相當的費用。儘管此舉立意甚佳，但仍應先在政治上與立法上取得共識較為可行⁸。

(5) 理論觀念面—傳統分析工具的缺點

一個新政策的適應過程可能於某一天展開，但是人們與其生活模式的因應調整卻是耗費時日，甚至長達數年。因此，為俾利政策執行，並使人們有足夠的時間對於政策進行調整，而不致於失去方向，所謂政策回應過程 (process of response) 的瞭解，對於政策分析而言是相當重要的。然而，以往以均衡 (equilibrium) 為基礎而受到廣泛使用的分析工具，由於其僅以最終狀態 (end-state) 為關注焦點，並無法說明上開各時間點上的改變。針對這種傳統分析工具的缺點，於是產生以下二種新看法：

⁷ Clinton V. Oster, JR. John S. Strong, (2000), Transport restructuring and reform in an international context, *Transportation Journal*TM39(3), American Society of Transportation and Logistics, USA.

⁸ . Goodwin P.B, (1989), The role of three : a possible solution to the political problem of competing objectives for road pricing, *Traffic engineering and control*, 30(10).

- 重新思考運輸需求成長與容量的關係，以及應該使用何種政策來處理與應付。
- 將來分析工具應該由以‘均衡’觀念為基礎轉變為以‘過程’觀念為基礎。

(6) 執行面—安全與環境保護規定之執行問題

一個很廣泛的想法是—民營公司為降低成本與增加利潤，是否會在‘安全’的相關支出上也大幅‘節約’(cut corners)⁹，這種問題曾經發生在一九九〇年代的蘇聯航空以及非洲及東南亞的私營渡輪上；而另一方面，為了減少對於環境所造成的衝擊，業者往往必須增加運輸成本。如果業者怠忽職責，那麼衍生的負面效應與社會成本必然相當大。因此，如何於管理規定中提供激勵誘因促使業者提升安全標準與減輕對環境所造成的損害，正是公部門於運輸事務上所面臨的眾多挑戰之一。在民營化的運輸系統當中，政府作為營運者的角色日漸減少，代之而起的是—承擔起監督者 (monitor) 與遊戲規則制定者 (setter of the rules of the game) 的角色，這個角色是愈來愈重要¹⁰。

4. 新世紀的運輸政策—具永續性 (sustainable) 與整合性 (integrated) 的運輸系統

具永續性與整合性的運輸系統是英國運輸政策白皮書的主軸，亦是目前世界先進國家發展的主流。

(1) 就永續性的都市發展和交通建設而言—

所謂 2020 年的歐洲展望 (a Eurovision for 2020): ‘建設高品質適合居住的都市與環境’ (high-quality livable cities)，是歐盟國家所欲達成的主要目標¹¹。而在評估是否符合永續發展的原則時，則必須考慮以下各項¹²：

- 道路擁擠的時間 (duration) 與強度 (intensity) 增加—平均而言，都市內的車流速度，每十年下降 5%，而擁擠的

⁹ . I. Savage, (1999), ‘The Economics of Commercial Transportation Safety’ in J.A. Gomez-Ibanez, W. Tye, and C. Winston, eds., *Essays in Transportation Economics and Policy*, Brookings, pp 531-562.

¹⁰ . Strong and Meyer, (1997), *Moving to Market: Restructuring Transport in the Former Soviet Union*, in *World Development Report 1997: The State in a changing world*, World Bank, USA.

¹¹ . David Banister, (2000), *Sustainable urban development and transport – a Eurovision for 2020*, *Transport Reviews*, 20(1), pp 113- 130.

¹² . European Federation for Transport and the Environment, (1994), *Green Urban Transport: A Survey*, Preliminary report 94/2, EFTE, Brussels.

嚴重性隨著都市大小而增加。

- 空氣汙染增加—除了在日本京都會議（the Kyoto Conference）中對於二氧化碳的減少設定目標值外，對於一氧化碳、二氧化氮、微粒等危害身體健康與空氣品質的污染源，亦已引起歐美先進國家的注意。在許多都市中，空氣品質已超過一九九七年世界衛生組織（World Health Organization；WHO）所建議的標準，空氣汙染不僅危害健康、傷害視力，並破壞生態與都市生活品質。
- 交通車流所產生的噪音與震動影響生活品質—根據一九九五年經濟合作開發組織（Organization for Economic Cooperation and Development；OECD）的估計，在已開發的國家當中，約有 15% 的人口長期暴露在噪音中，特別主要是由交通所產生的噪音。
- 道路安全性—根據 Downey 於一九九五年的統計，世界上每年有二十五萬人死於交通事故，另有一千萬人因交通事故而受傷，而同期間歐盟國家中的交通事故死亡人數是四萬四千人。
- 都市景觀的破壞—由於新闢道路或其他交通設施導致古蹟的破壞和開放空間的減少，亦影響都市景觀與生活品質。
- 為提供汽車通行的空間而剝奪行人、單車騎士與其他身心障礙者‘行’的權利。
- 車輛燃燒石油天然氣而產生的排放物，正是全球溫室效應的禍首。同時這些燃料都是不能再重新使用的資源。
- 都市的分散（decentralization of cities），使得旅次長度增加，並發展出不同的旅次型態，進而鼓勵小汽車的使用與減少有效率運輸系統的使用。因此，運輸如何同時扮演促進因子（facilitator）與限制因子（limiting factors），必須深入考量。
- 企業的全球化與重新佈置會影響區域或當地貨運的分配型態與強度。另一方面，高地價水準則會影響都市發展與運輸車流的型態。所謂永續性的都市發展，必須將都市空間作有效的運用，並減少發展所需額外的土地。
- 永續性的運輸系統必須符合在生態上的永續性

(ecologically sustainable)，使得運輸相關的污染水準低於人類所能安全忍受 (safely tolerate) 和環境所允許的負擔容量 (carrying capacity can allow)；在財務上的永續性 (financially sustainable)，亦即不需要花費比使用者付的費用還高的營運與維持成本；滿足在社會上的永續性 (socially sustainable)，提供每個人獲得基本的社交、教育與經濟活動的方法¹³。

另一方面，針對上開 2020 年的發展目標，產生了兩大行動方針，其一為發展環保導向的—'the eco-car'，此種汽車具有減低空氣污染、溫室效應、擁擠、交通運輸空間，並可維持高密度都市功能。同時並給予汽車製造業明確的投資信號 (signals)，其作法包括有：

- 增加對於 'the eco-car' 及相關技術研究發展的經費預算。
- 發展必要的基礎設施 (infrastructure)。
- 對於投資與生產這種車輛給予減免賦稅的激勵。
- 對於購買或使用大型而不具經濟性的車輛課徵較高稅賦。
- 取消所有對於私人車輛的補貼政策，並鼓勵人們使用 'the eco-car'。

其二則是減少對於旅運的需求，至於作法則包括：

- 增加對於通信科技 (諸如電子通信 (telecommuting)、視訊會議 (teleconferencing)、電子購物 (teleshopping) 及電子商務 (telebusiness) 的使用。
- 都市提供服務 (如就業、娛樂及社交機會) 與設施 (如開放的空間、安全寧靜的生活環境) 的可及性 (accessibility) 與鄰近性 (proximity)。
- 提供大眾運輸工具較高的優先權，並配合前者所創造的鄰近性，縮短旅次長度，俾利提高走路、騎自行車或搭乘大眾運輸工具的旅次。
- 在許多 '成功的都市' 交通改善經驗中，以荷蘭的阿姆斯特丹為例，儘管其汽車所有率自一九六〇年代末即開始快速攀升，但是，市中心的交通流量在一九九〇年代卻明顯減少，甚至於已趨穩定。同期間，在德國的 Groningen (中

¹³ . J.F.K Akinbami, S.O. Fadare, (1997), Strategies for sustainable urban and transport development in Nigeria, Transport Policy, 4(4), pp 237- 245.

小型都市)中,市區旅次中竟然有50%是使用自行車。這種'綠化的都市運輸政策'(the greening of urban transport policies)¹⁴,並不容易達成。其原因係各相關政策,諸如都市規劃、大眾運輸、交通管理、區域政策與經濟結構重整等等相互作用的影響之下,可能會產生中和(neutralize)、加強(reinforce)或其他期望或非期望的副作用(desirable or undesirable side effects)。再者,吾人亦可以發現:運輸政策常常是政治妥協下的產物。故政策的成功條件,除了有賴於詳細規劃與決策者的才能及執行的意志力之外,更應將政治結構視為重要議題予以正視考量。

(2) 就整合性運輸而言—

所謂整合性運輸政策,若以英國運輸政策白皮書的內容而言,其係意謂者以下各項觀念¹⁵:

- 透過運具內與各運具間的整合,使得各運具不僅能夠貢獻所能,更能讓使用人在各運具間很容易地進行運輸活動。
- 經由與環境的整合,使人們對於運輸的選擇能夠創造出更好的生活環境。
- 與國家的、區域的、地區性的土地使用規劃進行整合,如此一來,運輸與土地規劃工作合而為一。不僅俾利永續性的運輸選擇,亦將減少對於運輸的需求。
- 與教育、衛生及財富創造的政策相結合,使得運輸能夠幫助人們創造出一個較公平、更具包容力的社會(make a fairer, more inclusive society)。

由上可知,欲達到整合性運輸的目標,必須有賴中央及地方跨組織(或部會)(cross-departmental)的協調(co-ordination)與合作(co-operation),方能竟其功。白皮書中亦對於運輸計劃的評估提列出環境、安全、經濟、可及性與整合性等五大目標¹⁶,各目標並列有次目標。然而由於上開五大目標與其他政策及政府部門並無明顯相關性,致使難以評估某一交

¹⁴ . Stefan Bratzel, (1999), Conditions of success in sustainable urban transport policy—policy change in 'relatively successful' European cities, *Transport Reviews*, 19(2), pp 177- 190.

¹⁵ . J. Hine, (2000), Integration, integration, integration.....Planning for sustainable and integrated transport system in the new millennium, *Transport Policy*, 7(3), pp 175- 177.

¹⁶ . P. Jones, K. Lucas, (2000), Integrating transport into 'joint-up' policy appraisal, *Transport Policy*, 7(3), pp 185- 193.

通運輸方案能對其他領域的政策產生何種程度的衝擊。

英國政府於一九九七年八月二十一日至十一月十四日舉行全國對於整合性運輸政策的諮詢與研討會，其間獲得超過7300項建議。經過分析後，對於本項政策獲得以下共識¹⁷：

- 一致認為人們需要更多的選擇機會（people want more choice）。
- 人們需要政府對於行人、騎士設置更多、更好的設施。
- 降低汽車使用有利於環境衛生，鼓勵以散步或騎乘單車上班或者從事活動，以維護道路安全，並關心當地空氣品質及噪音水準。
- 支持大眾運輸的發展，並希望政府能夠多投資於運輸，而所需經費來自於擁擠費或稅賦徵收。
- 一致體認到：郊區擁有特定的運輸問題必須審慎考量。
- 認為興建更多道路已不是解決擁擠與污染的唯一方法，某些地區的道路瓶頸和安全、繞境（bypasses）道路的興建與更好的運輸管理措施等問題，皆必須予以正視改善。
- 貨運車流應該轉移改由鐵路或沿岸海運予以運輸，同時亦要求依據現行法律中對於卡車載重、車速、駕駛人工作小時等等限制嚴格執行，以改善空氣品質，道路安全與擁擠現象。
- 運輸政策必須與其他政策，特別是土地使用規劃，相互整合，以降低旅運需求。
- 透過教育與宣傳，讓人們改變以往的態度而能夠多使用大眾運輸、自行車或走路，作為可接受的替代方案（acceptable alternatives）。

謹此，具體而言，英國的整合性運輸宣言，包括以下幾大項¹⁸：

- 更多的選擇（more choice）--使行人及自行車騎士'易於行'，並提供更多更好的公車服務、更優良的鐵路系統、安全的道路與包括航空及水運在內的運輸系統。
- 更整合的大眾運輸（more integrated public transport）--透

¹⁷ . DETR, (1998), 'A new deal for transport – Better for Everyone' – Annex B : Construction on integrated transport policy, www.detr.gov.uk/itwp/paper/annex/annexb.htm.

¹⁸ . DETR, (1998), 'A new deal for transport – Better for Everyone' – Chapter 3 -- Integrated Transport, www.detr.gov.uk/itwp/chapter3.

過運具合作提供緊密的旅程服務 (in pursuit of the seamless journey)、票證整合與適當訂價、時間表整合與服務的穩定性、無障礙運輸服務 (accessible transport for disabled people)、提供乘客服務與較佳的計程車服務。

- 將街道還給民眾 (streets for people) --整合當地道路，使市中心更加適於居住，創造更祥和的鄉村及市郊環境。
- 主幹道的較佳使用 (making better use of trunk roads) --整合規劃、投資策略、中心道路網路、提供駕駛人詳細資訊、保護當地環境、良好的開發控制、提高效率、提供適當的道路服務適當的車流、永續發展的航空、海運與內陸運輸系統。
- 海港與機場的較佳整合 (better integration of ports and airports) --泛歐網路 (trans-European Networks) 的建立，整合機場與港埠及地方性連接系統。
- 旅運安全 (travelling safely) --道路安全、速度政策、機車、公車與巴士安全、駕駛人工作時數、鐵路安全與水運安全等問題。

(二) 世界主要都市運輸規劃之比較

良好的運輸系統，不僅可以塑造高水準的都市生活品質，並有利於提升都市的各項機能—無論是在經濟活動上、社會文化上、或甚至於在國際聲望上。以美國聯邦運輸管理局 (the Federal Transit Administration) 而言，其估計：因為使用紐約的公共運輸系統而避免的擁擠成本、能源使用與空氣汙染等，對於社會提供了\$200 億美元的利益¹⁹。正因為如此，各國與各主要都市對於交通運輸的規劃無不審慎研究。所謂「鑑往知來」「他山之石可以攻錯」，從世界各主要都市發展的軌跡當中汲取可茲利用的經驗，自然成為國內都市發展規劃時不可或缺的一環。根據倫敦研究中心於一九九八年²⁰針對倫敦 (英國)、巴黎 (法國)、紐約 (美國) 及東京 (日本) 等國際四大都市於運輸規劃管理所做的研究，吾人可以發現若干重點值得瞭解與參考。

¹⁹ Federal Transit Administration, (1996), Impact of Mass Transit Investment: Selected urbanized Areas, FTA, Washington DC, USA.

²⁰ Caralampo Focas, (1998), The Four World Cities Transport Study, London Research Center.

1. 基本認知方面

- 四大都市皆有成熟的大眾運輸系統與四通八達的路網 (comprehensive road networks)。
- 在第二次世界大戰之前，四大都市都已向郊區發展。
- 而第二次世界大戰之後，四大都市同樣經驗了向郊外住宅 (exurbia) 發展的趨勢，亦即將都市的腹地亦予以都市化。
- 而上開向郊外住宅區發展的興起與擴展，大多仰賴小汽車的使用。
- 同時，永續性發展與環境品質的維持皆遭遇到空前未有的危機。
- 該研究除闡述四大都市發展的歷史趨勢外，並提供各都市在社經特性 (socioeconomic characteristics) 上的現況、旅次行為與交通運輸的基本設施等資料。
- 儘管四大都市未必以同一模式發展，但卻獲得共通性的結論：
 - (1) 更進一步的擴建道路並無法消除交通擁擠及其衍生的結果。雖然各都市仍不免有道路建設的計劃，但大多是著眼於興建衛星 (orbital) 道路與現有道路的路網聯結。
 - (2) 新建道路只能暫時疏解擁擠，其功能將迅速被潛在的旅運需求所淹沒。

2. 都市處理交通運輸問題的差異與相同點

- 處理擁擠、能源使用與污染排放
 - (1) 巴黎與東京—藉由促進住宅與就業的高密度成長 (high density development)，進而鼓勵使用大眾運輸工具與減少小汽車旅次。此二都市皆正在擴充其鐵路運輸系統與地下鐵路網的連繫。
 - (2) 倫敦與紐約—皆仰賴交通運輸管理的工具 (traffic management measures)。在倫敦，經過多年來的忽視之後，已著重於重建及提升現有系統的功能；而在紐約，運輸相關支出已相對地比以前少得多。
- 組織
 - (1) 巴黎與東京—強而有力的地方區域政府 (strong regional government) 控制運輸規劃，並執行長期計劃。而東京的規劃系統則另有追求共識的特色，其係以於中央機

構、地方機關與私人部門之間取得權力與責任的分擔為基礎，同時運輸營運亦由公私部門共同負責。

(2) 紐約—由於橫跨三州 (New York, New Jersey, Connecticut)，缺乏強有力的規劃與協調架構，開發計劃較屬分散性低度開發 (scattered low density developments)，且較傾向於隨意性 (haphazard)。

(3) 倫敦—策略性規劃指導與決策由中央政府提供。

● 運輸規劃過程

(1) 倫敦—

- ◇ 運輸規劃包含於整體開發規劃架構中，其內容包括有：結構計劃 (structure plan)、地區性計劃 (local plans)、倫敦與都會管理局及單一開發計劃 (unitary development plans) 等。
- ◇ 結構計劃由郡規劃當局所提出，並為發展與區域內的土地使用制訂政策與建議。
- ◇ 地區性計劃由行政區域當局產生，並詳細說明結構計劃中主要路網的改善建議，並對其他新建道路與改善提供意見。而自從廢除大倫敦議會 (the Greater London Council) 之後，其地區性計劃已改由行政區產生單一開發計劃，來實現結構計劃與地區性計劃的功能。
- ◇ 單一開發計劃必須涵蓋所有行政區域內的面積，並遵循其 DETR 制訂的策略性規劃之指導方針 (guidance)。
- ◇ 一旦單一開發計劃被採用，地區性管理當局必須重新審視其規劃，並對任何修正 (amendments) 提出建議。
- ◇ 地區性的公路當局必須呈送年報 (含交通運輸政策與計劃文件) 給 DETR 以爭取資金。
- ◇ 一九六八年鄉鎮與郡縣規劃法案 (1968 Town and County Planning Act) 明訂於擬訂結構及地區性計劃時，必須要有大眾的參與 (public participation)。
- ◇ 主要的運輸計劃方案必須充份、廣泛地進行諮詢，以獲取政府的資金補助。

- ◇ 一九八四年依倫敦區域運輸法案 (the London Regional Transport Act) 設立倫敦區域乘客委員會 (the London Regional Passengers Committee) 為法定機構，藉以表達乘客心聲，並監督大眾運輸的營運。
 - ◇ 有無數利益團體影響運輸規劃過程。
- (2) 紐約—
- ◇ 由營運部門提出實務上的需求。
 - ◇ 二十一世紀運輸衡平法 (the Transportation Equity Act for the 21st century ; TEA) 中指派都會規劃組織 (metropolitan planning organization ; MPO) 負有規劃之責。
 - ◇ 在上開法案規定之下，任何於容量上顯著的增加之前，必須進行一個重要的投資研究 (major investment study)，以評估符合運輸需求的所有替代方案。
 - ◇ 對於區域而言，在上開法案規定之下，尚包含有一億美金的特案，國會議員可透過特定區域選民的請求 (at the behest of a particular constituency) 而提出。因此，很多遊說團體於官方規劃過程之外，會透過政治上的力量尋求支持。
 - ◇ 為符合國家提供資金的規定，各州必須準備長期運輸計劃以期現有設施的使用率最大，執行擁擠管理策略，並透過運輸政策影響土地使用及都市開發。
 - ◇ 都會規劃組織必須建立區域運輸模式以作為長期區域計劃 (long term regional plans)、運輸改善計劃 (the transportation improvement programs) 及統合規劃工作 (unified planning work) 的指導方針。
 - ◇ MPO 負責協商爭取財源，理想上，並需反映出區域對於各計劃優先順序之共識。
 - ◇ 州計劃中，一般設定優先的分類為：讓既有設施回復良好的狀態→讓既有設施的服務最大化→儘量使旅次擴張最小化，當容量必須增加時，發展大眾運輸優先於公路運輸→改進管理觀念與技術，並注意潛在新技術的發展→促進經濟發展，使運輸與土地使用目標彼此相同。

- ◇ 長期發展計劃與州計劃一樣給予優先順序，運輸改善計劃必須依循這些優先順序，而其計劃通常係來自特定的地方或郡政府的建議案。
- ◇ 依據法律規定，對於長期計劃、運輸改善計劃、規費、道路橋樑收費標準及環境影響評估等之採行，必須舉行公聽會（public hearings）。
- ◇ 然而對於具爭議性的計劃方案（controversial projects），其決策，通常並非依據詳細的規劃報告與訂定的優先順序，而係透過政治協商過程。

(3) 巴黎—

- ◇ 一九九四年通過的區域規劃與發展方案（the regional planning & development programme）屬長期規劃，其涵蓋時限為 25 年（至 2015 年）。
- ◇ 運輸與土地使用的關係明訂於結構計劃（structure plan）當中。
- ◇ 最新版的結構計劃明訂的目標有：
 - 發展運輸系統以提高機動性，並涵蓋各種旅運需求，其包括有加強多運具間轉換的策略。
 - 改善大眾運輸網路，其包括延伸鐵路系統、在郊區興建衛星輕軌鐵路系統（orbital light rail system）、以及專用路權之下發展接駁性大眾運輸系統（feeder public transport system）。
- ◇ 地方政府與公營公司於起草土地使用及其他地區性計劃時，必須遵循上開計劃。
- ◇ 土地使用計劃由市府當局與中央政府（the region and the department）共擬。所需數據性資料則由區域性的規劃研究機構（the Institute d'Aménagement et d'Urbanisme de la Region Ile-de-France）提供。
- ◇ 大眾可以於地區性規劃文件討論時提出意見外，亦可透過所選出的代表於市府或部會階層討論時提出相關意見。
- ◇ 雖然結構計劃的批准端賴於中央政府，然而就區域而言，其有一個由不同組織（諸如公司、商業公會）包括 110 人的永久性經濟與社會委員會，可以對於

結構計劃提出中肯的意見。

(4) 東京—

- ◇ 依據國家綜合開發法訂定計劃 (the Comprehensive National Development Law)。目前執行的整體性長期土地使用結構計劃 (overall long-term land-use structure plan) 是於一九九八年所訂定的。
- ◇ 目前其中央政府正為 21 世紀的國家規劃藍圖訂定發展策略的準則。
- ◇ 為疏解日本人口集中以及企業沿著狹窄海岸線發展的情況，於是國家發展計劃中建議：
 - 建立四個開發走廊 (four development corridors)，其包括北至東 (the North-East)、日本海海岸、太平洋海岸及日本西岸等。
 - 推展將‘住宅區座落於綠野’ (residential areas situated in lush greenery) 的觀念，其方式是建立一些中小型都市、田園、森林、漁村等民眾新的生活空間。
- ◇ 依據道路改善緊急措施法 (the Road Improvement Emergency Measures Law) 訂定長期的道路改善計劃。最新的 5 年計劃，係以 2010 至 2015 年為目標年，並以 1998 至 2003 年的道路改善計畫為發展主軸。
- ◇ 鐵路系統的發展則係於交通運輸部門的控制之下，由交通政策委員會議 (the Transport Policy Council) 提出建議案。
- ◇ 鐵路與道路的改善方案必須為都市計劃的一部份，由省長或市長訂定的都市計劃必須與包括國家綜合開發計劃在內的各類計劃一致。
- ◇ 東京市政府起草一般性的規劃架構，諸如包括未來發展方向、改善目標、取得新的投資之方法，而後改善計劃就於該架構所列的規範內予以執行。
- ◇ 為確保充份納入民眾的意見，召開公聽會、意見的陳述與質詢等，皆是決策採行前必須進行的步驟。
- ◇ 於決策之前，東京市政府必須依據環境評估法

(Environmental Assessment Ordinance) 所訂定的準則，對於區域計劃進行各項評估。

- ◇ 東京規劃系統的特色是，其政策的決定必須是由地方政府、運輸業者與私人開發業者共同合作而成。

● 經費來源方面

(1) 倫敦—

- ◇ 雖然政府補貼仍是經費來源之一，但為減少補貼額度與減輕政府財政負擔，民營化與民營企業的參與仍是政府鼓勵的方式。相關的運輸計劃則泛及道路興建至輕軌系統的開發。
- ◇ 小汽車使用稅包括車輛登記稅 (registration tax)、燃料稅 (fuel tax) 與增值稅 (value-added tax) 等。
- ◇ 道路的興建與改善基金經由政府預算程序予以分配。
- ◇ 高速公路局負責高速公路與主要幹道新闢道路等的設計、興建、資金籌措與營運計劃；而地區性道路則由地方管理當局依政府授權範圍興建與維護。
- ◇ 興建新的鐵路系統目前是不允許的，但對於英格蘭東南部的區域性鐵路而言，則可以獲得營運上的補貼。
- ◇ 對於倫敦而言，地鐵系統的營運並未獲取政府補貼，而對於現有路線上的革新、新路線的興建、車站與車輛及公車營運等，則政府會給予經費補助，惟每年補貼額必須視政府財政與國家支出所排訂的優先項目先後而定。
- ◇ 由於認為私部門比較會管理大型投資計劃 (manage large capital projects)，因此，自一九九二年起展起所謂 'private finance initiative'，鼓勵私部門提供資金參與運輸服務及基本設施的提供。

(2) 紐約—

- ◇ 自一九九八年的 TEA 法案，延續了國會於一九九一年提供經費的原則，亦即於所有運具當中彈性使用運輸信託基金收入 (Transportation Trust Fund Revenues)，而非逐項分列。

- ◇ TEA 法案提供未來六年內至少有\$198000 百萬美金的經費，而其中有\$34000 百萬美金是供大眾運輸所需，至於各州所得經費比例，則是依據人口數與道路系統的涵蓋範圍而定。
- ◇ 依 TEA 法案設立一個基礎設施銀行 (Infrastructure Bank)，可以延長借貸，再由計劃收入支付。
- ◇ 國家基金在‘州’這個層階而言，僅係所有運輸經費的一個比例。就該三州政府而言，皆有專用的運輸經費來源 (dedicated source of transport funds)，主要來自州課徵的石油稅 (petrol taxes)、車輛相關費用 (motor-vehicle related fees)，其細目與比例諸如：車輛燃料稅 (motor fuel taxes)；所有於州內銷售、進口、提鍊的石油產品課徵 17.7%；卡車的重量/距離稅 (weight/distance)；車輛登記與牌照費；道路橋樑與隧道的通行費。
- ◇ 大眾運輸的營運與資本投資受到補貼，但補貼的標準因各州而異。

(3) 巴黎—

- ◇ The Syndicate des Transports Parisiens (STP) 和 The Economic & Social Development Fund 與區域相互負擔主要大眾運輸投資的責任。
- ◇ 大部份的 STP 預算係向巴黎所在的 Ile-de-France 內雇主 (員工超過 10 人以上的業者) 徵收的稅，其標準係依支付薪資總額的 2.2% 收取。而另一方面，該徵收所得稅額的 85% 多用做補貼大眾運輸業者於‘carte orange’季節性車票的營運上。
- ◇ 在中央政府與各區域間對於大眾運輸及道路資本投資存在著所謂規劃性契約。同樣的，與 STP 之間對於巴黎市的大眾運輸服務之提供亦有類似契約，這些契約在國家的五年計劃中是持續有效的。
- ◇ 一九九四年至一九九八年的規劃性契約，其總金額達到\$5700 百萬美金，而其中對於運輸網路的開發就達到\$3700 百萬美金 (\$1700 百萬美金專用於道路方面，\$2000 百萬美金專用於大眾運輸)。

- ✧ Ile-de-France 這個區域貢獻了補貼大眾運輸與道路方案資金來源的 75 至 80%，很顯然地，其對資金的貢獻程度遠大於政府對於區域運輸基礎設施的補貼。

(4) 東京——

- ✧ 運輸計劃的籌資、特定計劃的決定與資金的分配，納入大東京都會區市政府（Tokyo Metropolitan Government）的年度預算編列過程。
- ✧ 運輸計劃資金的來源包括有石油稅、車輛擁有稅（private car acquisition）、收費道路系統。
- ✧ 收費道路系統其籌資係經由政府、公營公司與私人企業（Guaranteed Government Bonds，Public Enterprise Bonds，Private Placement Bonds）。
- ✧ 對於地下鐵的基礎設施投資，其資金來源包括有來自於鐵路建設基金（railway construction funds）的零利率貸款、當地政府與中央政府的貸款。
- ✧ 私人企業對於東京的新建道路、鐵路系統等基礎設施，在財源上的挹助與參與，成為一項較有趣的創新作為，有關本項可由 Trans-Tokyo Bay Highway Project, JR Construction Corporation 的新軌道及擴展以及市中心至新市區的鐵路系統開發上予以說明。

(三) 港口都市發展與物流管理概念部份

自古以來，海港與所在地的都市發展具有相當密切的關係。不可諱言的，港埠確實是區域經濟的潛在資產，其透過乘數效果的機制（multiplier mechanism）對於所得、就業、空間集中等等產生相當廣泛（wide-ranging benefits）的利益；然而，港埠作業所衍生的交通問題、對於生活品質與環境的破壞等負面效果，又使港市當局與市民對於港埠的成長與擴建問題，陷入兩難的局面²¹。謹此，如 Hoyle（1996）所言²²，港

²¹ M.S. Husain, (1981), "Influences on Development Policy in the Port of Hamburg" in B.S. Hoyle & D.A. Pinder, (eds) *Cityport Industrialisation and Regional Development – Spatial Analysis and Planning Strategies*, London, Pergamon Press Ltd, pp. 87-101.

²² Brian Hoyle, (1996), "Ports, Cities and Coastal Zones : Competition and Change in a Multimodal Environment" in Brian Hoyle (eds) *Cityports, Coastal Zones and Regional Change – International Perspectives on Planning and Management*, England, John Wiley & Sons Ltd, pp. 1- 8.

口都市於區域發展上持續受到關注，如何謀求一個較為均衡、永續經營與具有整合性的解決之道，係為港市當局協調管理的當務之急。

基隆港地處臺灣東北角，三面環山，是一個典型的港口都市（cityport），其為創造臺灣經濟奇蹟（economic miracle）的主要港埠之一。然而，由於下列因素的影響，促使該港的發展面臨重大的挑戰。

1. 港埠功能的轉變

● 物流功能

在現今的航運市場環境中，許多航商貨主僅將港埠視為整體物流系統的一個次系統（sub-system），其重視的不僅僅是港埠——這個海陸的界面而已，而更注意的是整體物流供應鏈的品質及可靠性。因此，港埠的選擇是整體物流網路成本的函數，如何將海上、在港與內陸成本總和最小化，便成為業者選擇泊靠港埠的考量重點²³。另一方面，由於貨櫃航商可能基於船隊安排與其夥伴聯營的需要，所謂航商對於泊靠港埠的‘忠誠度’（loyalty），已不復存在²⁴。因此，減低港埠鄰近區域交通擁塞與提高港埠的作業能量，引進物流管理（logistics management）與‘one-stop shopping’的概念，促使貨物於港區順暢運作，並藉由增值性物流（VAL；value-added logistics）服務的提供，以達到降低整個供應鏈（supply chain）的成本與及時交遞（just-in-time）的目標，是 21 世紀港埠獲得航商青睞的主要競爭優勢（competitive edges）²⁵，基隆港自無法置身於此趨勢之外。

● 遊憩功能

由於所得與生活水準的提升、國內產業結構的改變以及人們對於娛樂與海上遊憩需求的增加，於歐、美、日等先進國家港埠區域範圍內設置遊艇碼頭、公園或人行步道等設

²³ Haynes, K.E., Hsing, Y.M and Stough, R.R., (1997) Regional port dynamics in the global economy : the case of Kaohsiung, *Maritime Policy and Management*, 24, pp 93-113.

²⁴ Slack, B., Comtois, C. and Sletmo, G. (1996), Shipping lines as agents of change in the port industry, *Maritime Policy and Management*, 23, pp 289-300.

²⁵ Alan Branch, (2000), *Export Practice and Management*, 4th edition, Singapore, Thomson Learning, pp. 90-93.

施，是相當普遍的作法²⁶。然而，如何於既有港區無法擴建之下，又試圖滿足上開來自於國人對於親水遊憩設施的需求，亦屬港市間正面臨的迫切課題之一。

- 都市再開發功能

基隆市是一個多山的小都市，就其總面積 3381.97 公頃而言，其中 95%是由山及山丘所組成，而那些坡度小於 5%的區域則皆集中於港區四週²⁷，這也使得幾乎所有市區開發計劃與土地使用政策，都與港埠息息相關；反之，港埠當局所主導的任何專案計劃，亦將對港口週邊之發展與交通發揮相當程度的衝擊。

- 環境保護功能

雖然港埠當局未必有權直接控制潛在的污染源（potential pollutants），然而，港埠除仍應對於當地環境的惡化負起一定責任外，更應積極扮演監督（overseeing role）的角色保護環境。舉例而言，歐盟於一九九四年制訂的環保作業規程（environmental Code of Practice）²⁸中就指出—只有‘乾淨且安全的港口’可以於商業競爭中存活下來（only a clean and safe port will be able to survive and that sustainable performance is vital ingredient of commercial viability）。而值得一提的是，該規程使用一種所謂的‘環境自我檢測法’（environmental Self-Diagnosis Methodology；SDM），來評估環境的強勢與弱勢（strengths and weakness）。而面對著來自環境保護團體與國際公約的壓力，港埠當局必須妥善處理這個議題。

2.航運業發展的全球趨勢

- 規模經濟（Economies of scale）

雖然有學者認為以船舶大型化降低單位成本的經濟利益，

²⁶ Luciano Can, (1996), “Environmental Perception and Planning” in Brian Hoyle (eds) *Cityports, Coastal Zones and Regional Change – International Perspectives on Planning and Management*, England, John Wiley & Sons Ltd, pp.63 – 82. Taking Plymouth as an example, the Sutton Harbour used to handle imported coal, exported steel and general cargo while today as a marina and fishing port.

²⁷ Keelung City Government, (2000), *Introduction to Keelung City*, www.klcc.gov.tw, Taiwan.

²⁸ David Whitehead, (1999), “Ports and the Environment – Towards Sustainable Development”, *World Ports Development*, pp. 100 – 101. The Code was a product of the European Sea Port’s Organisation (ESPO).

將會被陸上作業的不經濟以及削價以求滿載的作法吸收殆盡 (the benefits are quickly eaten up by land-side diseconomies and by the need to cut rates to fill the ships)²⁹。然而，船舶的大型化仍是不爭的事實。根據統計，在一九九六年時，全世界載重噸超過 80000 噸的 capsize 級礦砂船只有佔 5%，迄一九九〇年初期這類船舶已達 80%³⁰；而英國 Lloyd's List³¹更預測於 2003 年時，全球將有 228 艘載運量超過 5000 TEU 的貨櫃船，這個數目將是整個貨櫃船隊容量的五分之一。由於受限於天然條件，諸如水深不足、缺乏後線與陸上交通阻塞等問題，迫使基隆港必須審慎研擬對策。

- 軸輻式輸運系統 (Hub-and-spoke system)

為因應船舶大型化發展所導致泊靠港埠數的減少，以及規劃具有競爭優勢的服務網路以提高船舶營運效率與降低經營風險，目前世界各主要船公司無不積極透過異業間的垂直整合 (vertical integration) 與同業間的水平合作 (horizontal co-operation)³²，期能達到上開目標。此如同 Oster 和 Strong (2000)³³所提醒：為了能夠提供可靠的服務，必須注意軸輻式輸運系統網路的構建與各航運公司組織間結盟等問題。

- 港埠競爭 (port competition)

在上開網路系統之下，港埠將因彼此間的競爭而形成主、副港 (main port and side port) 的不同。一般而言，航商在規劃航線與選擇泊靠港埠時所考慮的因素包括³⁴：

- ◇ 港口是否位於主航路上，且擁有廣大商業腹地。
- ◇ 港口應該備有適當的設施與低故障率的裝卸設備及機

²⁹ Alfred J. Baird, (1999), "Container Vessels of the Next Generation : Are seaports ready to face the challenge?", *Ports and Harbours*, September, pp. 15 – 23.

³⁰ Martin Stopford, (1997), *Maritime Economics*, London, Routledge, pp. 393 – 420.

³¹ Janet Porter, (2001), "What's on the horizon?", *Lloyd's List magazine focus*, April, pp. 3 – 4.

³² T. Heaven, et al(2000), "Do mergers and alliances influence European shipping and port competition?", *Maritime Policy and Management*, 27(4), pp. 363 – 373. The so-called United Alliance includes Hanjin, DSR-Senator, Cho Yang and UASC; The New Grand Alliance includes P & O Nedlloyd, NYK, OOCL, Hapag Lloyd and MISC; The New World Alliance includes APL, MOSK and Hyundai.

³³ Clinton V. Oster, JR John S. Strong, (2000), "Transport Restructuring and Reform in an International Context", *Transportation Journal*TM, Spring, 39 (3), pp. 18 – 32.

³⁴ Rung Tsung Chen, (1992), *A satisfaction study of port conditions in Keelung, Taichung and Koahsiung harbours in Taiwan – the shipping operators perspectives*, Dissertation of Institute of Traffic and Transportation of National Chiao Tung University, Taiwan.

器。

- ◇ 港口有相當高的裝卸效率，而僅需支付較低的作業成本，同時該作業成本是可以明確估算的。
- ◇ 港埠當局是否可以提供專用碼頭（dedicated terminals）俾利彈性作業。
- ◇ 港埠所在國的政經環境是否處於穩定狀態。
- 港口重新配置與擴建（port relocation and expansion）
傳統港埠並不是專為服務超大型船舶而設計的，且由於這類港口常常位於集合都市中心（conurbation），致使水深不足、陸路交通擁擠與瓶頸等問題因應而生。而根據 Hayuth（1985）³⁵的研究，超大型貨櫃輪作業所需場地大小是過去的 10 倍。因此，港埠為取得競爭優勢，必須確認主要發展業務的方向、原有港埠基礎設施的條件以及船席場地是否必須重新配置或甚至於能否擴建等進行評估。

3. 交通與環境的負面影響

一般來說，港埠作業對於當地交通、環境與生活品質的負面影響很難完全消除。以基隆港市而言，於八十九年三月西岸聯外道路通車之前，其肩負東、西岸交通命脈已逾二十年高齡的兩座高架橋一旦必須封閉修護，交通擁塞、噪音與空氣污染等所產生的影響與衍生的社會成本，已為當地居民及航貨方所詬病。根據一九九七年的交通流量調查顯示，在交通尖峰時，上述東、西岸高架橋與臨港市區主要幹道的道路服務水準降到 C 級以下³⁶；另一方面，依據基隆市政府於臨港區域所設噪音監測站的調查結果，多數已超越 70 分貝³⁷，而裝卸散裝貨所造成灰塵與空氣污染進而影響交通安全的情形亦是十分嚴重。

³⁵ John H. Vandermeulen, (1996), "Environmental trends of ports and harbours : Implications for Planning and Management", *Maritime Policy and Management*, 23(1), pp. 55 – 66.

³⁶ Keelung Harbour Bureau, (1997), *The report of environmental impacts resulted from port activities in the vicinity of Keelung Port*, KLHB, Taiwan. The level of service (LOS) of these two main roads were from class C to E. According to Highway Capacity Manual published by Transportation Research Board, 1994, the LOS will be divided into six ranges, from A to F. If the LOS is class E, it indicates that the traffic volume of the road equals to its capacity.

³⁷ Environment Protection Bureau, (2000), *Noise survey report*, www.klepb.gov.tw/00/epbjobt.htm, Taiwan. Another survey conducted by Keelung Harbour Bureau showed that the value of noise was more than 95 dB nearby container terminals when rubber tyre gantry cranes were working.

對於港市發展及其衝擊的議題上，是相當值得探討的。雖然各國外學者可能以不同的角度偏重於特定項目的研究，惟其成果仍值得國內港市於發展時納入參酌。以下謹將所收集的文獻簡略如后：

- Wiherick³⁸於研究英國南漢普敦港時，著重於港埠所扮演創造就業的功能，並強調如果僅以工業層面衡量港市間的關係，將會低估港埠於當地經濟上的重要性。另一方面，其亦指出—港埠的擴建與否，將會受到當地與區域規劃策略（local and regional planning strategies，在此文當中指的是'South Hampshire Structure Plan'）所影響。
- Baird³⁹於英國佛里斯多港（Felixstowe）的研究中指出：該港對於創造就業與振興經濟皆有助益，其專用的鐵路（dedicated rail link）及繞過市區（bypassing the town of Felixstowe）且良好的陸運系統大大地降低交通衝擊。而由於擴建受限於自然保護區（nature reserve）的設置，為增加作業容量與因應競爭，船席加深、開發舊港區、後線區域規劃合理化、以及取得 Thamesport 及 Harwich 港的經營權等作法，皆是擴建受限的港埠，可以參考的策略。
- Bassette & Hoare⁴⁰認為未來英國布里斯托港（port of Bristol）的開發，不僅必須依照環保相關規定外，且勢必將面臨來自不同民意與政治團體的壓力。而這些輿情亦是影響鹿特丹港區⁴¹自一九七〇年代迄今擴展的因素。
- 而 Wolkowitsh⁴²則發現港埠的擴展不僅影響法國馬賽市

³⁸ M.E. Wiherick, (1981), "Port development, port-city linkage and prospects for maritime industry: a case study of Southampton" in B.S. Hoyle & D.A. Pinder, (eds) *Cityport Industrialisation and Regional Development – Spatial Analysis and Planning Strategies*, London, Pergamon Press Ltd, pp. 113 ~131.

³⁹ Alfred J. Baird, (1999), "Analysis of private seaport development : the port of Felixstowe", *Transport Policy* 6(2), pp 109 – 122. The key advantage of Thames port is the availability of land for expansion on what is a brownfield site. The terminal is not therefore subject to the same environmental constraints. The ownership of Harwich offers the potential to transfer ro-ro activities out of Felixstowe allowing more room to meet expected increases in container traffic.

⁴⁰ Keith Bassette & Tony Hoare, (1996), "Port-city relations and coastal zone management in the Severn Estuary : the view from Bristol" in Brian Hoyle (eds) *Cityports, Coastal Zones and Regional Change – International Perspectives on Planning and Management*, England, John Wiley & Sons Ltd, pp. 9 – 24.

⁴¹ Chris True, (2001), "Rotterdam areas focus – the bigger they are, the harder they fall", *Port Development International*, March 2001, pp 12 – 14. In 1970's, the steel industry expansion scheme in the northern Delta was shelved due to the pressure from 27 groups while now the development of Maasvlakte II has caused much debate and needs political consensus in the coming future.

⁴² M. Wolkowitsh, (1981), "Port extension as a factor in urban development : the case of Marseille" in B.S. Hoyle & D.A. Pinder, (eds) *Cityport Industrialisation and Regional Development – Spatial*

(Marseille) 的都市住宅區位與工業開發，亦意謂著運輸系統必須隨之更新與發展。後者則如新鐵公路路網的延伸、濱海公路及貫穿市區的海底隧道等之興建。

- 就美國洛杉磯 (Los Angeles) 的 'the Alameda Corridor Transportation Project' 計劃⁴³ 而言，編號 400 (Pier 400) 的碼頭擁有專用的運輸系統，因此可以很輕易地聯接靠近碼頭邊的鐵路及兩條高速公路，如此減少了超過 200 處的交通衝突點，不僅降低了交通擁擠程度，更減少路口停等時間達百分之九十，同時改善了空氣品質。類似的作法亦運用於該國紐約/紐澤西港的 'Portway scheme' 計劃⁴⁴ 中，該計劃包括建造卡車專用道路及將 Newark 的 Doremus Avenue 大橋重新改建，試圖將卡車帶來的衝擊予以最小化。
- 然而運輸網路的便利性，對於人們的海上休閒娛樂而言，卻可能形成一種障礙。Norcliffe⁴⁵ 在以加拿大港埠驗證 Heckscher-Ohlin 假設時發掘上開現象。同時亦發現：隨著可支用所得的增加與都市生活型態的改變，對於休閒娛樂的需求，使得港埠及其相關產業在土地使用上與當地居民呈現相當競爭的態勢，亦因此使得許多港埠行業已陸續移出港埠區域，許多倉庫或改建為辦公室或旅館，甚至於公園，而部份水域則改供遊艇泊靠。
- Inoue & Tsutsumi⁴⁶ 於研究日本博多港 (Hakata port) 親水設施開發所衍生的交通流量時建議，由於旅次產生會使交通條件隨之惡化，並增加問題處理的複雜性。因此，日後有關開發案，必須審慎考量。

綜合上述研究，吾人可以發現——儘管各研究重點不同，但不

Analysis and Planning Strategies, London, Pergamon Press Ltd, pp. 87 – 101.

⁴³ Larry Nye, (2000), "LA North America Survey – Ahead of one's piers", *Port Development International*, April, 2000, pp 24 – 26.

⁴⁴ Chris True, (2001), "New York – The big apple bites back", *Port Development International*, Feb, 2001, pp 22 – 25.

⁴⁵ G.B. Norcliffe, (1981), "Process affecting industrial development in port areas in Canada" in B.S. Hoyle & D.A. Pinder, (eds) *Cityport Industrialisation and Regional Development – Spatial Analysis and Planning Strategies*, London, Pergamon Press Ltd, pp. 151 – 163. There are four major processes in this hypothesis, they are capital intensification and job elimination by port industries; greater space consumption by port industries; land use competition within port areas; and the growth, in port areas, of industries not directly related to the port.

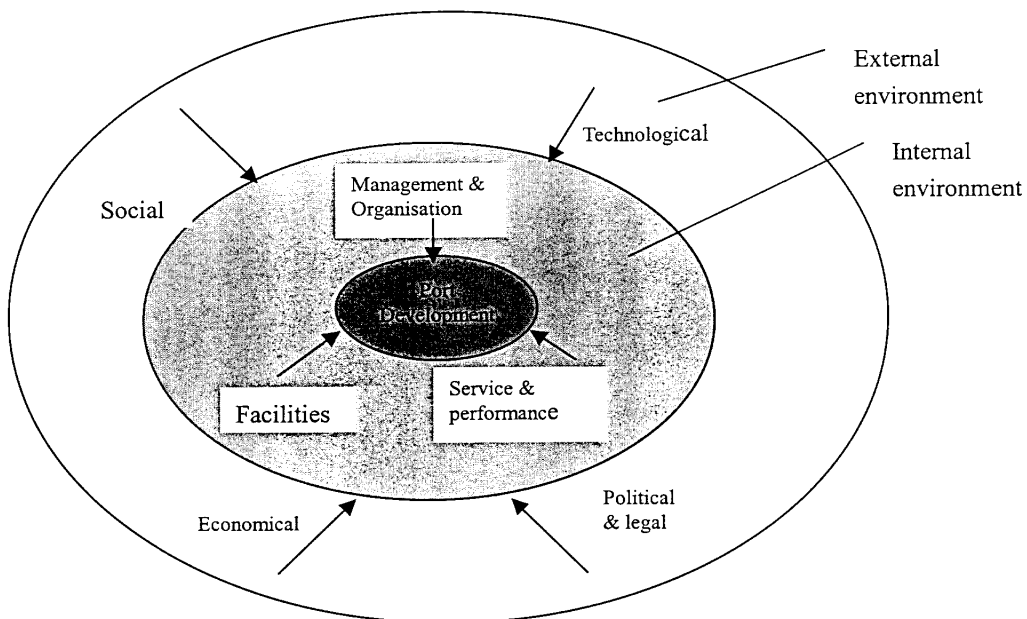
⁴⁶ Nobuaki Inoue & Kayoko Tsutsumi, (1996), "Cityport redevelopment and transport" in *International Symposium of Port and City Development*, July 11- 12, 1996, Taiwan, pp 4.1 – 4.16.

外乎探討 **STEP** (Social, Technological, Economical, Political and legal) 等四大層面的因素，而這些幾乎皆屬港埠當局與營運人無法控制的外在環境因素 (external factors)：

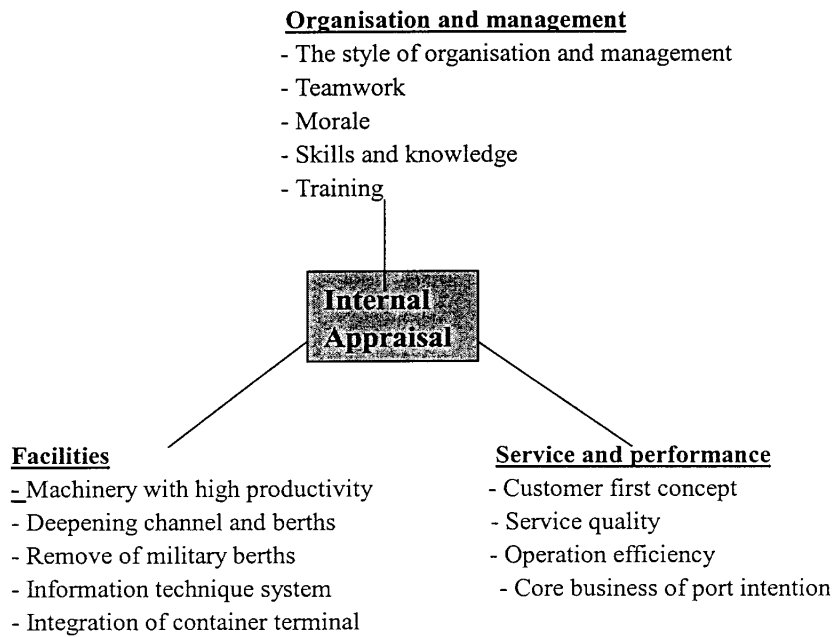
- 社會 (Social)
- 技術 (Technological)
- 經濟 (Economical)
- 政治與法律 (Political and legal)

而事實上，除了外在環境因素之外，尚有諸如管理與組織 (management and organization)、設施 (facilities)、以及服務與績效 (service and performance) 等內在環境因素 (internal factors) 足以影響港埠發展。

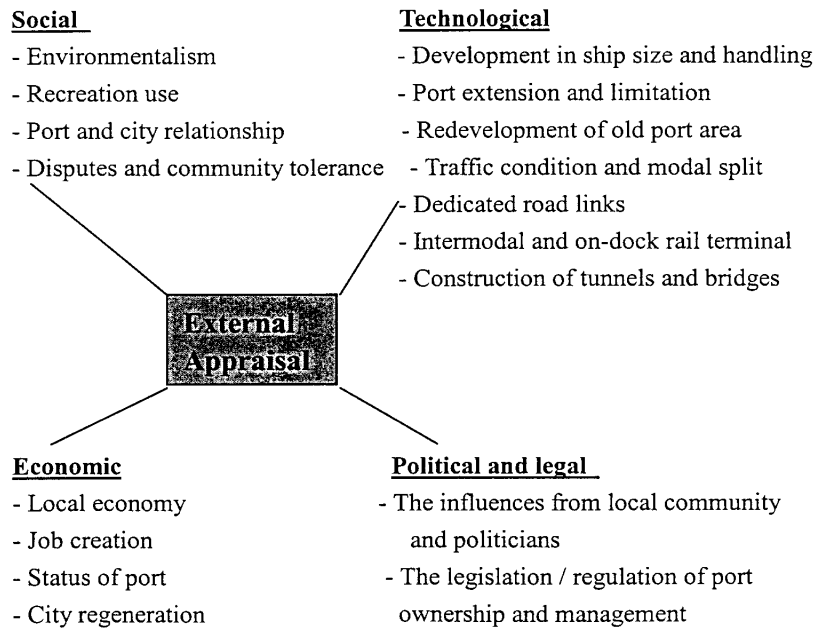
根據以上所得內、外在環境因素，吾人可以建議一個港埠發展的觀念模式如圖一，至於評估重點項目則可參考圖二及圖三。



圖一：港埠發展的觀念模式



圖二：港埠發展內在評估項目



圖三：港埠發展外在評估項目

七、建議事項

有關本次研習過程暨具體成果已述如前，至於重要的建議事項則簡述如后：

- (一) 發展具永續性 (sustainable) 與整合性 (integrated) 的運輸系統，是 21 世紀的運輸政策方向。
- (二) 永續性的運輸系統必須符合在生態上的永續性 (ecologically sustainable)，使得運輸相關的污染水準低於人類所能安全忍受 (safely tolerate) 和環境所允許的負擔容量 (carrying capacity can allow)；在財務上的永續性 (financially sustainable)，亦即不需要花費比使用者付的費用還高的營運與維持成本；滿足在社會上的永續性 (socially sustainable)，提供每個人獲得基本的社交、教育與經濟活動的方法。
- (三) 整合性運輸政策，係意謂：透過運具內與各運具間的整合，使得各運具不僅能夠貢獻所能，更能讓使用人在各運具間很容易地進行運輸活動；經由與環境的整合，使人們對於運輸的選擇能夠創造出更好的生活環境；與國家的、區域的、地區性的土地使用規劃進行整合，如此一來，運輸與土地規劃工作合而為一。不僅俾利永續性的運輸選擇，亦將減少對於運輸的需求；與教育、衛生及財富創造的政策相結合，使得運輸能夠幫助人們創造出一個較公平、更具包容力的社會 (make a fairer, more inclusive society)。
- (四) 綠化的都市運輸政策 (the greening of urban transport policies)，並不容易達成。其原因係各相關政策，諸如都市規劃、大眾運輸、交通管理、區域政策與經濟結構重整等等相互作用的影響之下，可能會產生中和 (neutralize)、加強 (reinforce) 或其他期望或非期望的副作用 (desirable or undesirable side effects)。吾人亦可以發現：運輸政策常常是政治妥協下的產物。故政策的成功條件，除了有賴於詳細規劃與決策者的才能及執行的意志力之外，更應將政治結構視為重要議題予以正視考量。
- (五) 更進一步擴建道路並無法消除交通擁擠及其衍生的結果。而新建道路只能暫時疏解擁擠，其功能將迅速被潛在的旅運需求所淹沒。亦即，興建更多道路已不是解決擁擠與污染的唯一方法，某些地區的道路瓶頸和安全、繞境 (bypasses) 道路的

興建與更好的運輸管理措施等問題，皆必須予以正視改善。
另一方面，一項成功的運輸政策必須考量到人的因素（human factors）及對於旅次產生者的動機進行瞭解。

- (六) 為一次性挹助財源並解決擁擠與環境汙染等問題，可透過道路訂價（road pricing）課予汽車駕駛人或所有運輸使用人相當的費用。儘管此舉立意甚佳，但仍應先在政治上與立法上取得共識較為可行。
- (七) 將來運輸規劃分析工具應該由以‘均衡’觀念為基礎轉變為以‘過程’觀念為基礎。而政府作為營運者的角色日漸減少，代之而起的是一承擔起監督者（monitor）與遊戲規則制定者（setter of the rules of the game）的角色，將會愈來愈重要。
- (八) 為解決基隆港市對於港口發展、都市運輸規劃與土地使用政策等議題之爭議，港市間設置一個整體規劃委員會或類似組織統籌處理的作法是受到肯定的。
- (九) 為消弭基隆港東岸交通流量負擔與導引穿越性車流，開鑿東西岸間的港埗隧道或興建跨海大橋、興建東岸聯外道路以及重新考量與鐵路或沿岸海運等聯運等方式，都是值得再思考的替代方案。
- (十) 為以貨櫃業務發展為核心競爭力，並考量親水遊憩的需求（騰出東岸二至四號碼頭結合海軍碼頭，整體規劃遊憩活動與設施），以提升鄰近居民生活品質，有關轉移現有基隆港散雜貨業務至其輔助港之想法，是可行的。
- (十一) 由於擴建受限於自然條件，為提升基隆港港埗競爭力，除船席航道濬深與開發舊港區外，提高服務品質與作業效率，減少航貨方於港埗的物流成本並提供業者更多加值性服務，是基隆港未來努力的方向之一。
- (十二) 檢附英文版論文一份供酌參。

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Cityport Development and Local Impacts
-- A Case Study of Keelung

Rung Tsung Chen

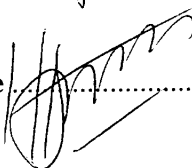
**A dissertation submitted in partial fulfilment of the
requirements of the University Diploma in Professional
Studies in International Shipping and Logistics Management**

University of Plymouth
Institute of Marine Studies

Declaration

This is to certify that the work submitted here was carried out by
the candidate Rung Tsung Chen

Candidate's signature and date Rung Tsung Chen 25/5/01

Supervisor's signature and date  25/5/01

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Acknowledgements

I would like to thank my sponsor – Taiwan Government for giving me the chance to study here and my supervisor Dr. H. Heijveld for his advice during my research and report writing.

A special thanks to Miss Grech Sylvie (Port of Marseille), Mr. Klaus-H. Luebcke (Port of Hamburg), Miss Lee, Leader Lin, Lu , Soong and Chtsao (Port of Keelung) who have helped me with this project by answering to my questions or collecting related materials. Without these people I would not be able to complete this project in the way I did.

Thanks to my parents and wife for their supports. I love all of you.

Summary

As a major actor in the provision of transportation services, cityports have strong impacts in local environment, community and those urban transport planning and land use factors that are perceived to have influence on the operations of the port. In this project, in order to identify the relationship between cityport development and its local impacts around the Keelung city, Taiwan, and further to provide concrete suggestions in future development, a conceptual model which includes external and internal factors appraisal is developed and a case study and comparison approach which could supply useful alternatives through reviewing from four so-called advanced cityports is also used.

As to all alternatives, such as setting up an overall planning committee or similar organisation; excavating a tunnel or building a bridge connecting West and East Bank; construction of a dedicated transport link and intermodal transport; the ideas of shift of the operating of general cargo and bulk to its auxiliary port; and the suggestions in management or organisation, facilities, service and performance aspects, which all obtained from analysis and would be worth adopting by Keelung Port are summarised in details as context.

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Abbreviation

	<u>Page</u>
1. dB – decibel	15
2. DWT – deadweight tonnes	10
3. IT system – information technique system	28
4. O/D survey – origin / destination survey	19
5. SDM – self-diagnosis methodology	9
6. STEP factors – social, technological, economical, political and legal factors	19
7. TEU – twenty foot equivalent unit	5,10,11,12
8. ULCC – ultra large crude carrier	9,11
9. VLCC – very large crude carrier	11

Chapter 1 : Introduction

Cities and ports are frequently intertwined in their location development, functions and problems from the past to today. The port is usually viewed, on the one hand, as a potential asset to the regional economy, capable of generating wide-ranging benefits from making a substantial contribution to income and local employment through the multiplier mechanism to providing locations to various industries and getting profits from the external economies resulting from spatial concentration¹. On the other hand, the traffic and related negative impacts resulted from the ports are also harming and damaging the local environment and quality of life of residents who live in the vicinity of the port area. Thus, in some case, port growth has been a controversial issue between port authority, city government and habitants and how to make an 'appropriate' decision is usually a dilemma.

It is not surprising that, as Hoyle² (1996) said, the role of the cityport in a regional development context continues receiving increased attentions, in terms of the impacts of rapid urban growth and port activities on local environment and in terms of the research for a more balanced, sustainable and integrated approach to the management of port-city regions.

Port of Keelung, a natural deep harbour protected by mountains on three sides and locating near the northern tip of Taiwan (see figure 1), is a typical cityport which enclosed by Keelung city and has played a pivotal role in Taiwan's renowned 'economic miracle'. While the port enjoys its glories given by people, it also not only faces fierce port competition but also encounters all foregoing disputes that should be resolved. For this study, it is the intention to address these aspects of port development in advanced cityport.

The objectives of this study are therefore :

1. To analyse the cityport development scheme in terms of
 - (1). the current situation
 - (2). port extension

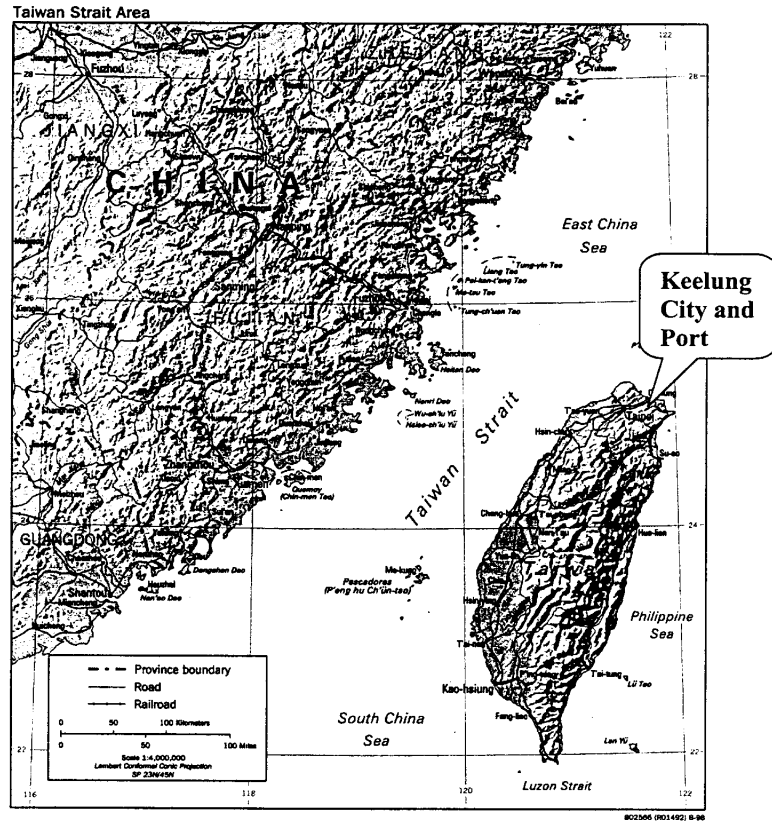
¹. M.S. Husain, (1981), "Influences on Development Policy in the Port of Hamburg" in B.S. Hoyle & D.A. Pinder, (eds) *Cityport Industrialisation and Regional Development – Spatial Analysis and Planning Strategies*, London, Pergamon Press Ltd, pp. 87-101.

². Brian Hoyle, (1996), "Ports, Cities and Coastal Zones : Competition and Change in a Multimodal Environment" in Brian Hoyle (eds) *Cityports, Coastal Zones and Regional Change – International Perspectives on Planning and Management*, England, John Wiley & Sons Ltd, pp. 1- 8.

- (3). local impacts in economy, traffic, environment and urban regeneration.
 - (4). changes of uses of areas of the port
- 2. To investigate the global trends related to cityport development and to assess those measures adopted in reducing negative impacts.
 - 3. To develop a conceptual model and use a case study and comparison approach to provide concrete suggestions in cityport development in terms of
 - (1). external factors
 - (2). internal factors

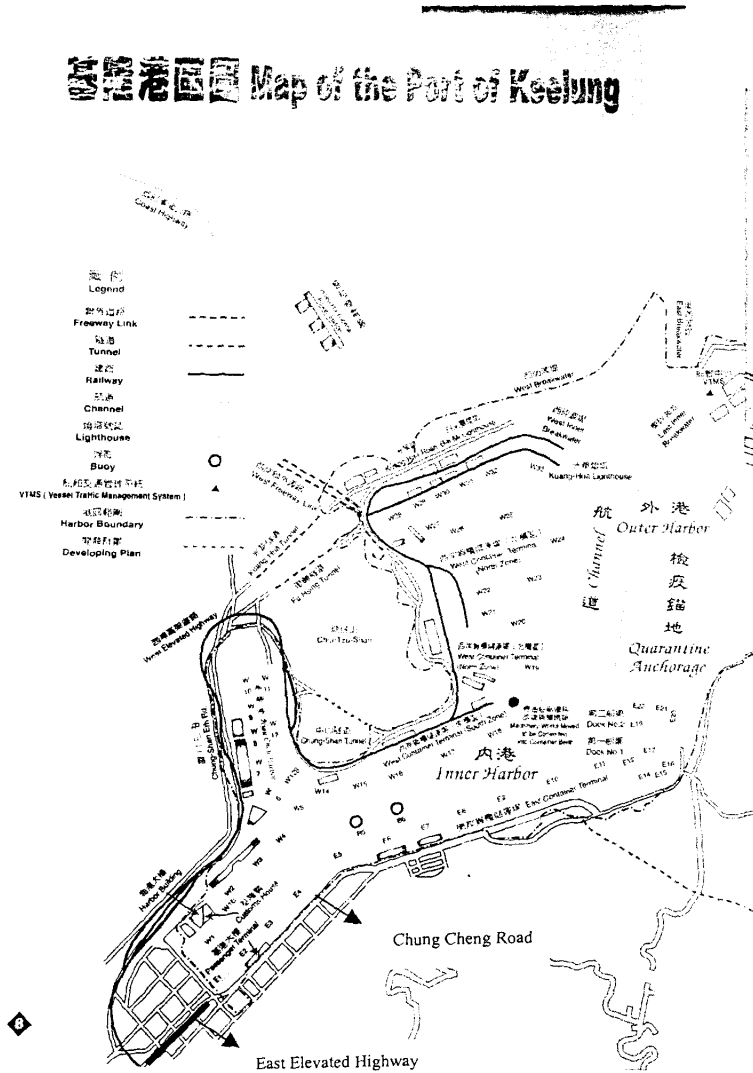
There are six chapters included in this study. In addition to the first Chapter -- Introduction, Chapter 2 discusses the background of Keelung port, the changing role of port functions, the global trends in shipping industry and the negative influence in traffic and environment resulted from port activities. Then literature review and conceptual model development are presented in Chapter 3. Further the methodology of this study -- a case study and comparison approach is provided in Chapter 4. In Chapter 5, all external and internal factors related to port development are divided into seven parts and analysed in details respectively. Finally, a concluding Chapter is presented.

Figure 1 : The location of Keelung City and Port



Source : www.libs.utexas.edu/libs/pcl/map_collection

Figure 2 : Keelung port



Source : Keelung Harbour Bureau

Chapter 2 : Background

2.1 Brief review of Keelung Port

Since built in 1886, the port of Keelung has been an important gateway for foreign trade in northern Taiwan, which is Taiwan's political and economic centre. The port, divides Keelung City into East and West Bank, encompasses approximately 572 hectares in water area and has the following key features.

- 57 wharves in total, (15 for container, 23 for general cargo, two passenger terminals and 17 for service boat, warships and engineering vessels) over 9,000 meters in total length (see table 1 and figure 2).
- Main channels –15.5 meter depth.
- Berth –14.5 meter maximum depth.
- Turning basin 650 meter in diameter.
- Average tidal ranges only 0.73 meter.

Although Keelung port owns diversified wharves, in order to strive for the efficiency and revenue in doing business, it seems that the operation for container ships is its core business³. In year 2000, the port ranked as 27th largest container port⁴, the total annual container throughput was 1.96 million TEU, among all its rivals around the world. At the meantime, due to its multi-functions in operation, the tonnage of incoming and outgoing cargo was over 80 million metre-ton (or revenue-ton) in the same year⁵.

As to the port planning and operation now are under control of port authority not city government. Even there is one non-periodic meeting held between port authority and city government in order to deal with controversial topics, however there are many conflicts related to land use policy, traffic management measures, environmental protection still existed. In order to mitigate the tensile circumstance which confronting each other and improve the communication channel and further shorten the gaps existed between two parties, it is argue in setting up an overall planning committee or similar organisation to deal with these topics in the coming future.

³. Financial Department of Keelung Harbour Bureau, (2001), *Statistic report of year 2000*, KLHB, Taiwan. According to the report, the volume of container throughput accounts for 79.66 per cent of total cargo volume handled in year 2000. On the other hand, the revenue from container handling activities accounts for 67.88 per cent of total annual revenue.

⁴. Matthew Beddow, (2001), "Top 30 Ports", *Containerisation International*, March, pp. 93.

⁵. Keelung Harbour Bureau, (2000), *Introduction to port of Keelung*, KLHB, Taiwan.

2.2 The changing role of cityport function

It is noteworthy that in the last three decades, people lived in Keelung city really welcomed port's progressive plans due to the benefits resulted from job creation⁶ & income growth. But now, protests were voiced and letters published by the local press while air pollution, especially produced from bulk cargo handling and vehicles use diesel oil; traffic congestion, vibration and car accidents from heavy vehicles; noise; intrusive car parking and lacking of safe recreational spaces all are the main themes in daily arguments. Thus, the function of port to local community was changing a lot.

On the other hand, as to the cityport evolution, Hoyle (1988)⁷ proposed a diachronic model embracing five stages: they are the primitive cityport, the expanding cityport, the modern industrial cityport, and the retreat of the city from the waterfront and the redevelopment of the waterfront. It seems that the port of Keelung has come to the last stage which is in line with the community's want and the needs of sustainable urban development and land use policy. On the other hand, the port today is not only a link in a transport chain but also is trade and distribution centres. Such changes will lead to the extension of cityport functions as below.

- Logistics
- Recreation
- Urban regeneration
- Environmental protection

2.2.1 Logistics function

With the aim of improving its own competitive edge and understanding the needs of its customers for integrated supply chain management, following the world's leading port – Port of Singapore⁸, Keelung has an ambition to develop function similar to 'Distripark' which can provide extensive warehousing and cargo consolidation facilities and enormous cost saving in customs duties, labour, handling and market distribution. Such an integrated

⁶. Institute of Geography, University of Taiwan, (1999), *Overall development plan of Keelung City – final report*, Keelung City Government, Taiwan. According to the latest survey, the population who involved in direct operational services (conservancy, pilotage, customs, cargo handling) and ancillary services (from shipping company to the naval outfitter) account for 15 per cent (24,000 persons) of total employment (159,000 persons) in Keelung city.

⁷. Adalberto Vallega, (1996), "Cityports, Coastal Zones and Sustainable Development" in Brian Hoyle (eds) *Cityports, Coastal Zones and Regional Change – International Perspectives on Planning and Management*, England, John Wiley & Sons Ltd, pp. 295- 305.

⁸. PSA Corporation Ltd, (2001), *About PSA -- Properties*, www.psa.com.sg/properties/10-8.html, Singapore. There are four Distriparks in port of Singapore, they are Keppel, Alexandra, Pasir Panjang and Tanjong Pagar Distripark.

logistics approach to the flow of goods involving 'just-in-time' deliveries, lower inventory cost, value added service, centralised distribution and continuous access to the port infrastructure. At the port side, it will intensify berth utilisation and its infrastructure thereby reducing the risk of congestion and increasing the throughput of the port⁹.

Table 1 : Details of Wharves in Keelung Port

Number	Length	Depth	Purpose	Number	Length	Depth	Purpose
W1&1B	*	*	Customs	W27	150	-7	GC
W2	204.5	-9	Passenger & GC	W28	*	*	Special
W3	183	-9	GC & Bulk	W29	178	-4.5~6.5	GC
W4	167	-9	GC & Bulk	W30	180	-10.5	Grain
W5&6	*	*	Military	W31	165	-10.5	Bulk
W7	106	-9	GC	W32	165	-11	Bulk
W8	136.4	-8	GC	W33	210	-11.5	Oil
W9~12	*	*	Working boat	W33B	95.8	-6.5	Oil
W12B	251	-6.5~9	Bulk	E2	200	-9	Passenger & GC
W14	172.4	-9	GC	E3	170	-9	GC
W15	148.3	-9	GC	E4	145	-9	GC
W16	156.5	-12	Container	E5	*	*	Military
W17	207	-13	Container	E6	180	-9	GC
W18	215.4	-13	Container	E7	178	-9	GC
W18B	113.8	-8	Bulk	E8	240	-12	Container
W19	324.3	-14.5	Container	E9	220	-12	Container
W20	325.6	-10.5	Container	E10	200	-12	Container
W21	236.6	-10	Container	E11	200	-13	Container
W22	190	-11	Container	E12~18	*	*	Coastal
W23	210	-11	Container	E19	220	-9	Bulk
W24	240	-13	Container	E20	120	-6	Bulk
W25	300	-13	Container	E21	113	-9	Bulk
W26	210	-11	Container	E22	113	-9	Bulk

Source : Keelung Harbour Bureau (year 2000)

⁹. Alan Branch, (2000), *Export Practice and Management*, 4th edition, Singapore, Thomson Learning, pp. 90- 93.

2.2.2 Recreation function

A port used to be a place for production rather than for recreation. People have stayed away from ports during last several decades. Because of the change in industry structure and the increasing demand for recreation, marine recreation zone that reserved to develop as marina, marine park or seaside footpath is not unusual¹⁰.

For Keelung port, after removing the enclosing wall and hosting the Dragon-Boat Festival during last five years, the 'secret' of port operation has been unveiled and thus shortened the distance between the port and local community. In the year 1999, the first marina emerged in old port area¹¹. However, the further open-up proposal, such as filling and levelling up part of the inner port as city plaza¹², has been forwarded and argued. In port's opinions, due to it seems that there is no space to extend port's area now¹³, the foregoing idea of reclamation of inner port is impossible. Thus, how to protect existing water-based recreation facilities and promote appropriate development of new opportunities around the cityport area, is a new task confronts with port authority and city government.

2.2.3 Urban regeneration function

Keelung is a hilly and small city. Its total area is 3381.97 hectare while 95 per cent are hills and mountains and the areas which gradient is less than 5 per cent are concentrated near port¹⁴. Therefore all development scheme and land use policy are closely linked to the port. Any special project being carried out by port authority will exert considerable influences on local traffic impacts and urban development around nearby area. For example, the newly built West Bank Outward Highway system has succeeded in diverting the traffic produced at the West-Bank container terminals and also enhanced the regeneration of those areas along the new motorway.

¹⁰. Luciano Can, (1996), "Environmental Perception and Planning" in Brian Hoyle (eds) *Cityports, Coastal Zones and Regional Change – International Perspectives on Planning and Management*, England, John Wiley & Sons Ltd, pp.63 – 82. Taking Plymouth as an example, the Sutton Harbour used to handle imported coal, exported steel and general cargo while today as a marina and fishing port.

¹¹. There is one berth and its back up area has been leased to a private company who exploits the area as marina.

¹². Keelung City Government, (1998), *Overall Review and Modification of Masterplan of Keelung City*, Taiwan.

¹³. China Port Consultant Inc., (1996), *The Development of Keelung New Port*, Keelung Harbour Bureau, Taiwan. The new port extension has been suspended due to the high costs and engineering problems.

¹⁴. Keelung City Government, (2000), *Introduction to Keelung City*, www.klcc.gov.tw, Taiwan.

2.2.4 Environmental protection function

It is the right time for cityport to share the responsibilities for the degradation and deterioration of local environment. For example, in Europe, the European Union produced their own environmental Code of Practice in 1994. One of the most important statements was that – ‘only a clean and safe port will be able to survive and that sustainable performance is vital ingredient of commercial viability’. They could use a special environmental Self-Diagnosis Methodology (SDM) to make an assessment of their own environmental strengths and weakness¹⁵. For Keelung port, following the urges from local environmental protection groups and related international regulations, the port has shouldered its obligations and implemented its overseeing role to protect the environment although most potential pollutants are not direct controlled by the port.

2.3 The global trends in shipping industry

Since container ships entered the liner shipping market in 1970's, the evolution in related technological improvements and operation systems as well as the development of ultra large crude carrier (ULCC) for liquid bulk and capsize dry bulk carrier have affected the destiny of port in terms of decline or prosperity.

The following global trends can be identified :

- Economies of scale
- Hub-and-spoke system
- Port competition
- Port relocation and expansion

2.3.1 Economies of scale

From last three decades to today, shipping lines are constantly searching for greater economies of scale through upsizing in an effort to reduce unit cost although others may argue that the line haul saving are minimal and the benefits (from economies of scale) are quickly eaten up by land side diseconomies and by the need to cut rates to fill the ships¹⁶. However, from table 2¹⁷ and 3, we could see that the trend of increasing in ship size is

¹⁵ . David Whitehead, (1999), “Ports and the Environment – Towards Sustainable Development”, *World Ports Development*, pp. 100 – 101. The Code was a product of the European Sea Port’s Organisation (ESPO).

¹⁶ . Alfred J. Baird, (1999), “Container Vessels of the Next Generation : Are seaports ready to face the challenge?”, *Ports and Harbours*, September, pp. 15 – 23.

¹⁷ . William V. Packard, (1984), *Sea Trading, volume 1—The Ships*, London, Fairplay publication, pp. 89 – 98.

inevitable. For example, according to statistics¹⁸, in 1969 only about 5 per cent of iron ore was shipped used in capesize vessels, which can load over 80,000 deadweight tonnes (DWT), but by the early 1990 over 80 per cent of the trade was shipped in vessels of this size. A recent report released from Lloyd's List¹⁹, predicted that by the end of year 2003, a probable 228 container ships in excess of 5,000 TEU will be in service, accounting for a fifth of the entire containership fleet capacity.

Due to its natural limitation in physical conditions, such as water depth restriction, scarcity in acquiring of back up space, sub-standard berth length and land side traffic congestion, Keelung port must review these situations and face the challenge when formulating a port development strategy.

2.3.2 Hub-and-spoke system

Liner services, carrying about 60 per cent of the value of goods shipped by sea²⁰, play a vital part in the global trading network. In order to improve competitiveness, enhance operation revenue and provide 'just-in-time' service without increasing investment capital in building new ships and operation risks, liner shipping companies, especially for container lines, not only use vertical integration such as co-ordination with inland hauliers to provide door-to-door service, but also introduce horizontal co-operation such as merges or acquisitions (e.g. Maersk and Sealand, APL (American President Lines) and NOL (Neptune Orient Lines)) or formation of alliance (e.g. The United Alliance, new Grand Alliance and new world Alliance)²¹ and use space charter, slot pooling as their strategies.

However, for the sake of improving the operation efficiency of ships while in line with the development of post-panamax containerships, reduction of port calls and optimum subdivision of the transportation chain between larger ships and feeders are significant factors when formulating their competitive strategies. Thus, as Oster and Strong (2000) said²², attentions began to be paid to the role of networks and scope economics. The need to provide frequent, reliable services over a specified network has given rise to transport

¹⁸ . Martin Stopford, (1997), *Maritime Economics*, London, Routledge, pp. 393 – 420.

¹⁹ . Janet Porter, (2001), "What's on the horizon?", *Lloyd's List magazine focus*, April, pp. 3 – 4.

²⁰ . Drewry Shipping Consultants, (1996), *Global Container Markets*, July, pp. 6.

²¹ . T. Heaver, et al(2000), "Do mergers and alliances influence European shipping and port competition?", *Maritime Policy and Management*, 27(4), pp. 363 – 373. The so-called United Alliance includes Hanjin, DSR-Senator, Cho Yang and UASC; The New Grand Alliance includes P & O Nedlloyd, NYK, OOCL, Hapag Lloyd and MISC; The New World Alliance includes APL, MOSK and Hyudai.

²² . Clinton V. Oster, JR John S. Strong, (2000), "Transport Restructuring and Reform in an International Context", *Transportation Journal*TM, Spring, 39 (3), pp. 18 – 32.

systems characterised by hub-and-spoke networks, feeder system and organisational affiliations intended to complete or extend service network.

Table 2 : Ship size for tankers and dry bulk carriers

carrier	Type / DWT	Length (metre)	Draft (metre)	Beam (metre)
Tankers	Handy (10,000- 49,999)	144 ~ 180	8.4 ~ 11.3	23.5
	Panamax (50,000- 69,999)	224	12.7	<= 32.3
	Aframax (70,000- 99,999)	240	13.5	42.0
	Suezmax (100,000- 199,999)	269	16.2	*46.2
	VLCC (200,000- 299,999)	326 ~329	19.6 ~20.9	54.0
	ULCC(300,000- 550,000*)	371 ~415	23.1 ~ 28.6	60.0 ~ 63.0
Dry bulk	Handy (10,000- 29,999)	147 ~ 174	8.9 ~ 10.1	21.6 ~ 24.4
	Handymax (30,000- 49,999)	181 ~ 189	10.9 ~ 11.2	27.3 ~ 30.3
	Panamax (50,000- 79,999)	218 ~223	12.4 ~ 13.1	31.7 ~ 32.1
	Capesize (80,000- 150,000*)	245 ~ 287	13.3 ~ 17.8	37.1 ~ 46.8

Note : "*" : an approximate figure of Suezmax with deadweight around 150,000.

Source: 1. Martin Stopford, (1997), *Maritime Economics*, pp. 393 ~ 420.

2. William V. Packard, (1984), *Sea Trading Volume 1 – The Ships*, pp. 89 – 98.

Table 3 : Ship size for container ships

Company Name	Date of delivery	Capacity (TEU)	Length (metre)	Draft (metre)	Beam (metre)	Boxes across on deck
OCL	1972	3,000	287.0	13.0	32.1	13
Hapag Lloyd	1981	3,500	246.5	12.5	32.2	13
USL	1984	4,300	289.0	12.0	32.0	13
APL	1988	4,340	275.2	12.5	39.4	14
Hapag Lloyd	1991	4,400	294.0	12.6	32.2	13
HMM	1992	4,411	264.1	13.5	37.1	15
NYK	1994	4,743	299.9	13.0	37.1	14
OOCL	1995	4,850	276.0	12.0	40.0	14
Maersk	1996	6,000	318.2	14.0	42.8	17
P&ON	1998	6,690	299.9	13.0	47.0	17

Source : Alfred J. Baird, (1999), "Container Vessels of the Next Generation :

Are Seaports ready to face the challenge?", *Ports and Harbours*, September, pp. 15.

For the assignment of hub ports, in an extreme case, De Monie (1999)²³ even proposes a scenario in which future 15,000 TEU mega containerships will be deployed on the main East-West routes and North-South linkage and maintained with feeder ships of anywhere from 250 to 6,000 TEU while only four ‘mega hubs’ in the world.

2.3.3 Port competition

Under such a network system, port competition is inevitable fierceness. As to the criteria for shipping companies to decide the rotation and port calls at least include items as follows²⁴ :

- Port should locate at main shipping routes while with wide hinterland.
- Port should own suitable facilities and machinery while with low breakdown rate.
- The operation efficiency will be high while with minimum calculable costs.
- Port could provide dedicated terminals with flexible operation.
- Under stable economical and political environment.

After assessing its weakness pursuant to the foregoing threats, the port tried to urge its key customers to stay in Keelung port and enhance its strengths through privatising the stevedore first in 1999 and then dredging water depth, enlarging container terminal and introducing incentive rate programs, such as reducing port tariff and signing rate agreement with shipping lines²⁵. Whether these measures will succeed or not is too early to conclude.

2.3.4 Port relocation and expansion

Because traditional liner ports are not designed to serve ultra large ships and these ports tend to be close to the centre of conurbation, therefore, the initial problems most ports face when it handles larger vessels is water depth restrictions quickly followed by land traffic congestion and resulting bottlenecks locally. According to Hayuth (1985)²⁶, the shift to containerisation cargo has far-reaching implication for port-road connections, and the added pressures on surrounding environment that comes from the very larger port areas

²³. Lutz Wittenberg, (1999), “Feasibility and design of future mega containerships”, *Asian Shipping*, January, pp. 14 – 17.

²⁴. Rung Tsung Chen, (1992), *A satisfaction study of port conditions in Keelung, Taichung and Koahsung harbours in Taiwan – the shipping operators perspectives*, Dissertation of Institute of Traffic and Transportation of National Chiao Tung University, Taiwan.

²⁵. Keelung Harbour Bureau, (2000), *Highlights of enforcement in reforms and other projects – constitution and port tariff*, www.klhb.gov.tw, Taiwan.

²⁶. John H. Vandermeulen, (1996), “Environmental trends of ports and harbours : Implications for Planning and Management”, *Maritime Policy and Management*, 23(1), pp. 55 – 66.

required for storage and holding of containers up to ten times more space than required for former shipping method.

Thus, in order to solve these problems and to meet the needs of customers, it is reasonable for port to figure out the short-term scheme in port relocation and long-term plan for future expansion. As to these two topics, they would be affected by following factors.

1. The position / core business of the port's intention :

That is whether the port has been recognised and assigned as main port or side port by its clients and whether the strategy is right or not for the port to develop as a container / multi-functions / or specialised port. As mentioned before, Keelung port's intention is to develop as a container port which located at main world shipping routes, but due to physical limitations in development, its intention should be not a easy task.

2. The integration in land use of the port :

With the aims of achieving high utilisation and operation efficiency, especially for container terminal, it is important to maintain the integration in land use to facilitate all activities related to cargo handling and storage. This reason could be used to explain why the port already has a project to relocate its shipyard, which now block its two West Bank container terminals²⁷.

3. The influences from environmental protection :

In order to eliminate pollution and purify air quality to benefit local community and obtain consensus regarding the positive value of port function, it is so common for the port not only to introduce state-of-the-art machinery but also to shift all high polluting cargo to be handled at the berth in outer port or relocate the berths or further to develop a new port area. Under this situation, Keelung port now assigns bulk carriers, especially for the ships carrying coal, sulphur and dangerous goods, to the outer port while also encourages its customers who transport these cargo to visit its auxiliary new port – Taipei port²⁸.

²⁷. Keelung Harbour Bureau, (2000), *Highlights of enforcement in reforms and other projects – civil engineering*, www.klhb.gov.tw, Taiwan.

²⁸. Union-Tech Engineering Consultants Co, (1999), *Report for development of Taipei Port*, Keelung Harbour Bureau, Taiwan.

4. The availability of multimodal transport :

In line with the needs of a one-stop shopping service from customers, providing an integrated transport system through combining rail, air and road transport is one of the main features of port development. Perhaps due to the lack of economies of scale²⁹, Keelung has had no incentive to develop a linkage between the port and railway. Until now, the common way to transport cargo from Keelung port to its hinterland is by road. However, the deteriorating traffic conditions (see paragraph 2.4) have affected the development of multimodal transport.

2.4 The negative influences in traffic and environment

Each cityport has its own distinct characteristics. It seems that it is still difficult to get rid of all the negative impacts, which occurred, by port activities, on local traffic conditions, the environment and quality of living. As mentioned previous, Keelung port is enclosed by the city. For the inward and outward traffic regarding port activities, except through two elevated highways serving for each bank, should use two main roads – Chung Cheng Road at the east bank and Chung Shan Road at west bank, as auxiliary (see figure 2). Due to two viaducts are old enough (over 20 years), illegal weight carrying existed and suffering from more precipitation and rainy days annual³⁰, it is not unusual to close them for maintenance. During the period of maintenance, traffic congestion is serious and complaints from local community and shipping industries are common and severe. On the other hand, all noise and air pollution resulted from port activities and traffic volumes are also against by residents live near port area. Further, the negotiation concerning maximum operational hours during midnight was emerged and the requests of compensation for damaging living quality was also put forward. As to those concrete influences could be enumerated as below.

- Traffic congestion
- Noise
- Air pollution

²⁹ . Jung Tai-Yuan, (1998), “Rail Intermodal Link for Taiwan”, *Lloyd's List Maritime Asia*, May, pp. 19 – 20. The TIRC (Taiwan Intermodal Rail Company) which formed by Hapag Lloyd, Maersk Taiwan, Mitsui OSK, P & O Nedlloyd, Neptune Orient Lines, Sea-land, Yangming Marine and Frederic R. Harris Inc., has proposed a sea-rail-road intermodal links, yet still in research.

³⁰. Ming Hui Shieh, (2000), *The overall planning and future prospect of Keelung port*, Keelung Harbour Bureau, Taiwan. The precipitation per year on average is 3334.8 millimetres while total number of rainy days is 210.9.

2.4.1 Traffic congestion

Due to lacking of backyard, especially in container terminals, thus the produced traffic volume between port and inland warehouses and 14 container freight stations nearby are considerable heavy. Meanwhile, owing to the distinctive characteristics of heavy-lorry, such as slow operation in accelerating / or reducing speed, long turning diameter in changing direction and longer and bigger object than other vehicles etc, congestion in each terminal gate while waiting for entry permission, and in foregoing main roads and superhighway are inevitable. According to the latest traffic survey³¹, the level of service for these roads, especially during peak hours, was reduced to under class C. After completion of West Bank Outward Highway in the year 2000, the situation has been mitigated at the West Bank while there has been no change, but even a further deterioration at the East bank.

2.4.2 Noise

According to a noise survey during July to October in the year 2000 ³²(see table 4) released by Environment Protection Bureau of Keelung City Government, most of the average decibel (dB) measured during certain time period at location I, II, III and IV, which near port area, are over 70 (dB). Thus, it is not surprising that local residents grumble about the noise and try to prohibit heavy trucks from their communities and try to restrict working hours during the night.

2.4.3 Air pollution

Transport is perceived as an important contributor to environmental pollution³³. Once traffic congestion happens, owing to incomplete combustion of fuels under low speed, the air pollution which include total emissions of C_xH_y , CO_x and particles will be more serious than normal. In addition to that, discharging of bulk cargo, especially coal and

³¹. Keelung Harbour Bureau, (1997), *The report of environmental impacts resulted from port activities in the vicinity of Keelung Port*, KLHB, Taiwan. The level of service (LOS) of these two main roads were from class C to E. According to Highway Capacity Manual published by Transportation Research Board, 1994, the LOS will be divided into six ranges, from A to F. If the LOS is class E, it indicates that the traffic volume of the road equals to its capacity.

³². Environment Protection Bureau, (2000), *Noise survey report*, www.klepb.gov.tw/00/epbjob.htm, Taiwan. Another survey conducted by Keelung Harbour Bureau showed that the value of noise was more than 95 dB nearby container terminals when rubber tyre gantry cranes were working.

³³. Phil Goodwin, (1999), "Transformation of transport policy in Great Britain", *Transportation Research Part A*, 33, pp 655 – 669. Broadly transport is responsible in advanced industrial countries for about 5 per cent of total emissions of oxides of sulphur, 10 per cent of particles, nearly half of the hydrocarbons, over half of the oxides of nitrogen and around 80 per cent of carbon monoxide.

lime, during the prevailing period of northeast monsoon often irritates local community. The residents usually complain that all furniture as well as roads are covered by coal dust and it is also dangerous for them to drive motor and bike due to bad vision caused by wind with dust.

Table 4. Noise survey report (in year 2000)

Location	Date of survey	Time period per day	Equivalent sound level
I	13, July	1. 0:00 ~ 05:00	71.6
II	2, Aug	2. 05:00 ~ 07:00	71.2
III	28, Sep.	3. 07:00 ~ 20:00	70.7
IV	24, Oct.	4. 20:00 ~ 22:00	64.9
		5. 22:00 ~ 24:00	

Source : Environment Protection Bureau of Keelung City Government

Chapter 3 Literature review and conceptual model development

3.1 Literature review

As to the theme of cityport development and its impacts, there are some researches worth discussion. Wiherick (1981)³⁴ in his case study of Southampton, UK, centred upon employment and concluded that – if evaluation of port-city relationship solely in industrial terms will undervalue the significance of the port in the local economy. On the other hand, he also mentioned that the port extension would be affected and supported by local and regional planning strategies (in this case stipulated in ‘South Hampshire Structure Plan’). Until now, the port is Britain’s premier south coast port, it directly provides over 10,000 jobs and its inland distribution networks are equally impressive with its direct links to the national motorway and railway systems³⁵.

On the contrary, under the 1998 Act, the port of Felixstowe³⁶, the UK’s leading container port which also benefits to job creation, economy and owns dedicated rail link and good road network and reduces traffic bypassing the town of Felixstowe, had to fund and build a nature reserve which means there are now physical constraints to expanding the port further. Thus, in order to increase its capacity and deal with competition, deepening existing berths, redeveloping some of the older areas of the port, rationalisation of back-up land and even acquisitions of Thamesport and Harwich port are all its alternatives in port development.

However, the future development of port of Bristol³⁷ which not only has to conform to the emerging environmental agendas but also the pressure from different political control and bodies involvement. Those same public opinions and political oppositions as well as

³⁴ . M.E. Wiherick, (1981), “Port development, port-city linkage and prospects for maritime industry: a case study of Southampton” in B.S. Hoyle & D.A. Pinder, (eds) *Cityport Industrialisation and Regional Development – Spatial Analysis and Planning Strategies*, London, Pergamon Press Ltd, pp. 113 ~131.

³⁵ . Port of Southampton, (2000), www.abports.co.uk/southampton. About one third of its container traffic is handled by rail at the two rail-freight terminals adjoining the port estate.

³⁶ . Alfred J.Baird, (1999), “Analysis of private seaport development : the port of Felixstowe”, *Transport Policy* 6(2), pp 109 – 122. The key advantage of Thames port is the availability of land for expansion on what is a brownfield site. The terminal is not therefore subject to the same environmental constraints. The ownership of Harwich offers the potential to transfer ro-ro activities out of Felixstowe allowing more room to meet expected increases in container traffic.

³⁷ . Keith Bassette & Tony Hoare, (1996), “Port-city relations and coastal zone management in the Severn Estuary : the view from Bristol” in Brian Hoyle (eds) *Cityports, Coastal Zones and Regional Change – International Perspectives on Planning and Management*, England, John Wiley & Sons Ltd, pp. 9 – 24.

some non-economic arguments, such as compensation and new farms offers to the farmers, also influenced the present-day extent of the Rotterdam port area³⁸ from 1970's to today.

Wolkowitsh (1981)³⁹ took port extension as a factor in urban development of Marseille, France, and also thought that port growth not only affected the location of new residential areas and industrial development but also implied the modification and development of transport systems – the extension of new rail network, the road network and the construction of new streets, coastal motorway, motorway tunnel for long distance communication and avoiding traffic circulation and urban reconstruction.

In the case of Los Angeles, under the Alameda Corridor Transportation Project⁴⁰, the Pier 400 got a dedicated transport links with direct access to the near-dock rail and two highways and thus reduced traffic congestion by eliminating traffic conflicts at more than 200 street-level railroad crossings and lessened traffic delay at grade crossing by 90 per cent and also improved air quality by reducing train and truck emissions associated with delay and congestion. A similar approach adopted by port of New York / New Jersey is the 'Portway' scheme⁴¹ which includes a dedicated truck route and reconstruction of the Doremus Avenue bridge in Newark and tries to minimise local truck impacts.

However, it seems that the convenience of traffic network will also produce one negative influence. Norcliffe (1981) tested Heckscher-Ohlin⁴² hypothesis in port areas in Canada and found that the network of rail-lines enveloped the waterfront became a barrier making it difficult for people to enter the waterfront zone. On the other hand, the changes in urban life-styles and greater disposal incomes also led to the rapid growth of recreation uses and the competition in land use between port-related industries and local residents.

³⁸. Chris True, (2001), "Rotterdam areas focus – the bigger they are, the harder they fall", *Port Development International*, March 2001, pp 12 – 14. In 1970's, the steel industry expansion scheme in the northern Delta was shelved due to the pressure from 27 groups while now the development of Maasvlakte II has caused much debate and needs political consensus in the coming future.

³⁹. M.Wolkowitsh, (1981), "Port extension as a factor in urban development : the case of Marseille" in B.S. Hoyle & D.A. Pinder, (eds) *Cityport Industrialisation and Regional Development – Spatial Analysis and Planning Strategies*, London, Pergamon Press Ltd, pp. 87 – 101.

⁴⁰. Larry Nye, (2000), "LA North America Survey – Ahead of one's piers", *Port Development International*, April, 2000, pp 24 – 26.

⁴¹. Chris True, (2001), "New York – The big apple bites back", ", *Port Development International*, Feb, 2001, pp 22 – 25.

⁴². G.B. Norcliffe, (1981), "Process affecting industrial development in port areas in Canada" in B.S. Hoyle & D.A. Pinder, (eds) *Cityport Industrialisation and Regional Development – Spatial Analysis and Planning Strategies*, London, Pergamon Press Ltd, pp. 151 – 163. There are four major processes in this hypothesis, they are capital intensification and job elimination by port industries; greater space consumption by port industries; land use competition within port areas; and the growth, in port areas, of industries not directly related to the port.

Thus, some of port industries have been excluded from the central waterfront and transit sheds have been rebuilt as offices, hotels even parks while water areas changed to marinas.

As to the induced traffic from waterfront development, Inoue & Tsutsumi (1996)⁴³ conducted an origin / destination survey (O/D survey) around Hakata port, Japan, and found that – it is necessary to reassess the impacts due to the absorbing capacity in trip generation of waterfront development will result in degradation and complexity in traffic conditions.

3.2 Conceptual model development

Although each study discussed previous perhaps only centred on certain topic, however, after summarising all foregoing cases, there are still several main features existed in line with the background mentioned above. They are related to social, technological, economical and political & legal aspects.

1. Social – the recreational use of part of port area is an inevitable global trend and its impacts in trip generation and traffic condition need to be assessed.
2. Technological – due to the increase in ship size and cargo volume, ports need redevelop and further extend. On the other hand, in order to reduce negative impacts resulted from port-related activities, for advanced cityport it is common to develop a dedicated or direct transport links to divert the traffic.
3. Economical – port development will still be an important impulse to the boost of local and national economy and job creation.
4. Political and legal – the requirements of environmental regulations will exert significant influences on port development scheme continually and all related planning might be supported, modified or limited by local and national programs and the opinions from publics, political and interested groups.

It is not difficult to conclude that port development will be affected by external factors, such as Social, Technological, Economical, Political & legal (so-called **STEP** factors) which are almost uncontrolled by port operators. Except external factors, in fact, port development also has close relations with internal factors, such as management and organisation, facilities and service & performance which are usually under control of port

⁴³. Nobuaki Inoue & Kayoko Tsutsumi, (1996), “Cityport redevelopment and transport” in *International Symposium of Port and City Development*, July 11- 12, 1996, Taiwan, pp 4.1 – 4.16.

operators. Due to conventional mathematical methods are not appropriate in analysing these external and internal factors, thus, in order to reach all aims of this study, the technique of conceptual model which includes the discussion of port development and its related impacts in terms of social, technological, economical, political & legal, management & organisation, facilities and service & performance context respectively will be developed and showed as figure 3.

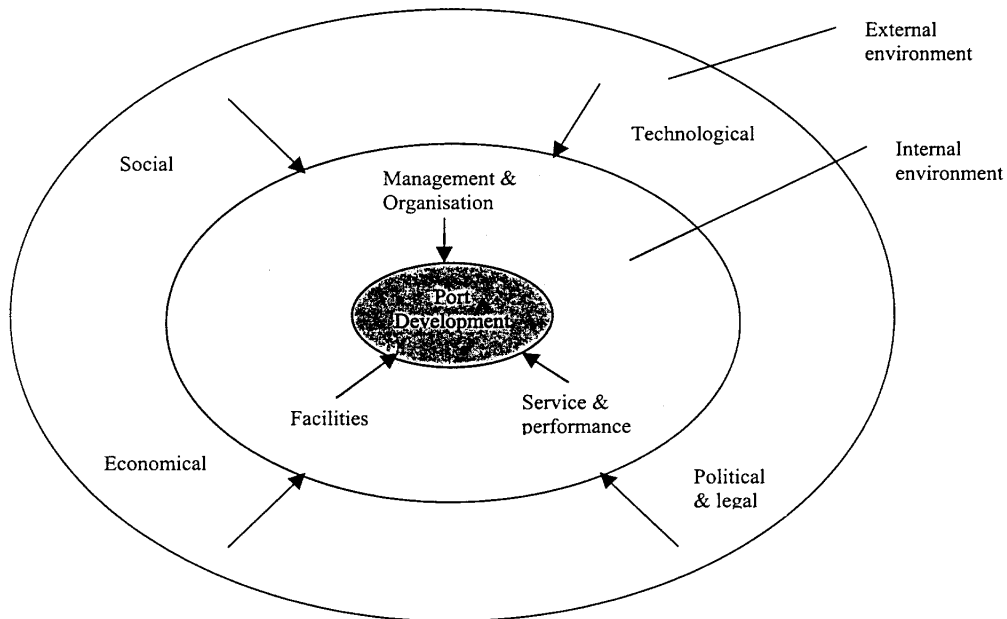


Figure 3 : Conceptual model of port development

3.3 Internal and external environment appraisal

Under such a model, there are several elements related to each factor will be worth appraising. Concerning those elements, for internal and external factors, could be specified as figure 4 and 5⁴⁴ respectively.

⁴⁴ .Wolfhard H. Arlt, (1987), "Information requirements in strategic planning in the ports industry : specification and management of a data base", *Maritime Policy and Management* , 14(1), pp 49- 61. Taking the framework of this paper as a reference, those factors and their elements related to port development would be adjusted appropriately as context in my project.

3.3.1 Internal appraisal

In the internal appraisal, the management and organisation, facilities and service & performance will be investigated while each contains detailed items as follows.

1. Management and organisation – the style of port organisation and management, the concept of teamwork, the enhancement in morale, skills and knowledge and necessary training should be evaluated.
2. Facilities – not only includes the purchase of machinery with high productivity, the program of deepening channel and berths, the planning in removing of military berths and the integration of container terminal but also contains the renovation of information technique system.
3. Service and performance – the core business of port intention, the establishment in the concept of customer first, the improvement in service quality and operation efficiency should be valued.

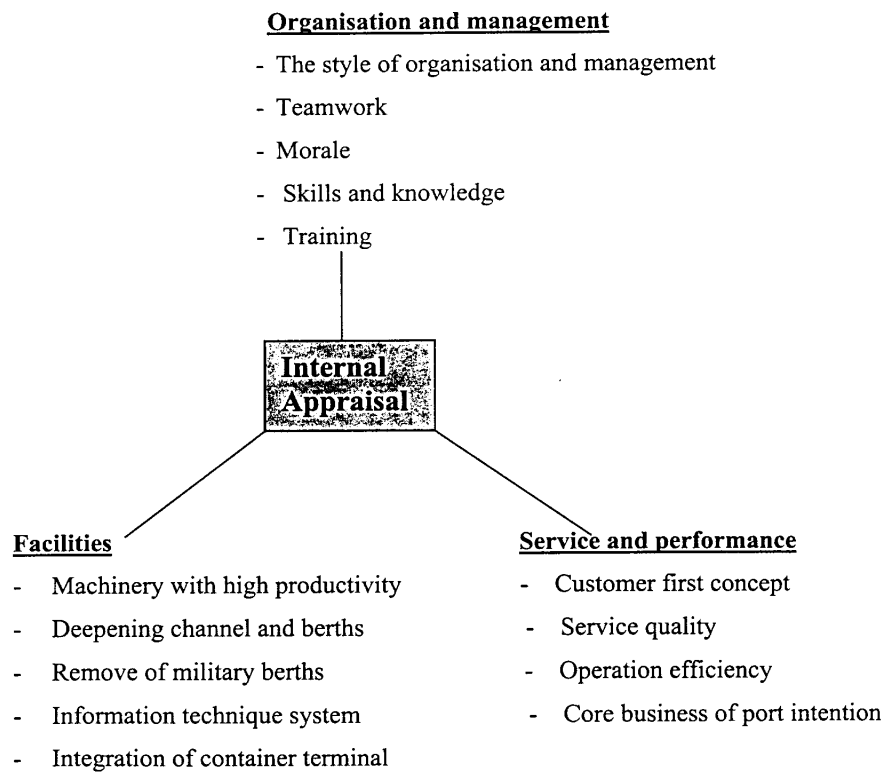


Figure 4 : Elements of internal appraisal in port development

3.3.2 External appraisal

In the external appraisal all detailed items would be enumerated as below.

1. Social – the vociferation of environmental matters and the need in recreation use signal a change in society’s appreciation and perception of its social surroundings while the relationship and disputes between port and city / local community should also be taken into account.
2. Technological – the development in ship size and handling will affect the need of port extension or redevelopment of old port area. Meanwhile, traffic condition and modal split of port’s throughput, the construction of dedicated road links, on-dock rail terminal, tunnels and bridges as well as the development of intermodal should be considered.
3. Economic – the influences in local economy, employment rate, city regeneration and status of port will be included.
4. Political and legal – The influences from local community and politicians and the legislation / regulation of port ownership and management will be discussed.

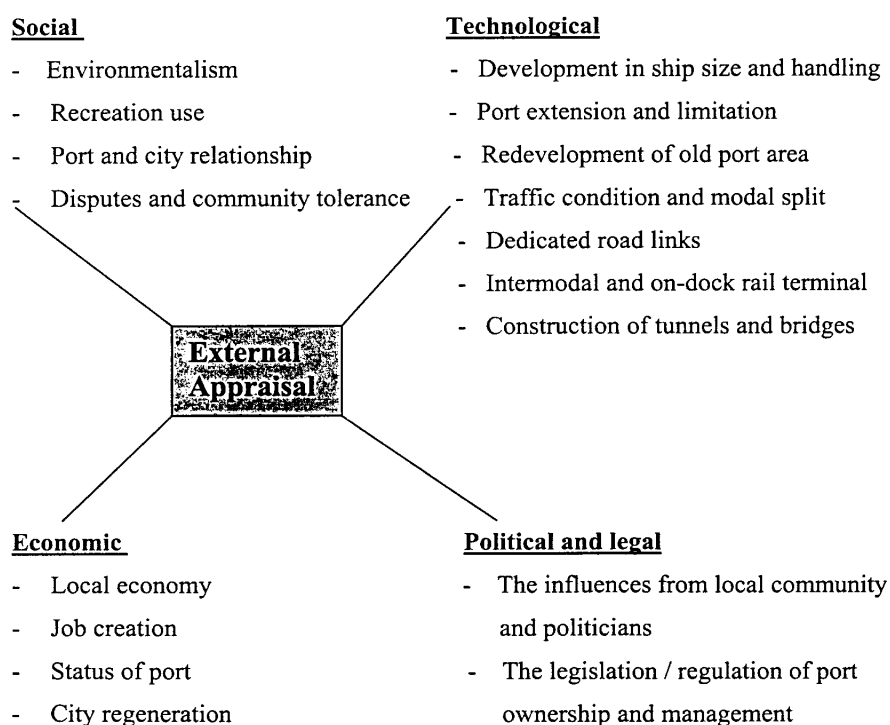


Figure 5 : Elements of external appraisal in port development

Chapter 4 Methodology

In order to provide concrete suggestions as to cityport development, a case study approach is basically adopted in this project. Such an approach would enable an in-depth treatment of the subject through experiences collecting from advanced cityports and further comparison.

On the other hand, as to the selection of so-called advanced cityports will concentrate on four ports, Felixstowe (UK), Marseille (France), Rotterdam (Holland) and Hamburg (Germany), all located in Europe while bases on following reasons :

- the availability and integration of data collections and analysis.
- the worth of similar history in cityport development phases and difficulties.
- the feasibility and value of reference for those measures adopted before or under proceeding.
- the importance of those ports in terms of their location or cargo throughput.
- the diversity in ownership and management of cityport.

Meanwhile, following the formulation of previous conceptual model and concerning of presenting a realistic and meaningful analysis, there are several key points existed within following discussion.

- the application of conceptual model will be carried out by dividing the broad subject area – all four cases changes in Europe and their experiences worth adopting on Keelung city and port development – into a series of contexts which contain social, technological, economic, political & legal, management & organisation, facilities and service & performance aspects.
- an understanding of inter-relationships of those contexts and their synthetic impacts through the mechanism provided by the conceptual model.
- the appraisal of each measures adopted in four cityports and determining alternative ways which will benefit to the Keelung cityport development in the coming future.
- all simplified diagrams which include related characteristics and comparison will be provided in order to facilitate understanding.

Chapter 5 Analysis

5.1 Social aspect

It is obvious that the concept of port extension would be wholly accepted and recognised by local community in its first developing phase due to its benefits in economy. However, it seems there is a limitation while the level of community tolerance limits has been reached. All of selected cityports confronted oppositions, such as environmental protection, recreation use, traffic congestion and urban development, in port extension during last three decades (details see appendix 1). As to the controversial issues at present, from table 5 we would know that Keelung port faces all problems above while each advanced cityport only faces certain issues even null.

From table 6, perhaps due to the difference in cityport ownership & management, political & legal environment or whether the consensus existed between the port and community, the extension of port of Felixstowe was limited under the 1988 Act while others would extend further even have space in preparative uses. Concerning the development of Keelung cityport, the support from local community and politicians as well as City Government will be a prerequisite at first step. It is necessary to set up a 'bridge' – an overall planning committee or similar organisation – between these parties to co-ordinate and resolve all disputes mentioned previous.

Table 5. Present disputes in selected ports

Criteria	Keelung	Felixstowe	Marseille	Rotterdam	Hamburg
Environment	√	√	–	√*	√†
Recreation	√	–	–	√*	√†
City regeneration	√	–	–	√*	√†
Traffic	√	–	–	–	√†

Notes : ‘*’ indicates the impacts of construction of Maasvlakte phase II; ‘†’ indicates the growing demand (not disputes) for high-quality land for residential purposes, offices, cultural, tourist facilities, transport or other economic function.

Source : Keelung harbour bureau, footnote 36, www.marseille-port.fr, Port of Marseille Authority, www.hafen-hamburg.de, www.hhla.de, Port of Hamburg, www.portofrotterdam.com.

Table 6. Present status in port extension, ownership and management in selected ports

Criteria	Keelung	Felixstowe	Marseille	Rotterdam	Hamburg
Ownership	Public	Private	Public	Public	Public
Management	Port Authority	FD & RC, HHC	Port Authority	RMPM	the Ministry of Economic affairs
Operation	Public / Private	Private	Private	Public / Private	Private
Influences from politician / local / law	√	√	√	√	√
Port Extension	limitation	limitation	space available	space available	space available

Source : Keelung harbour bureau, footnote 36, www.marseille-port.fr, Port of Marseille Authority, www.hafen-hamburg.de, www.hhla.de, Port of Hamburg, www.portofrotterdam.com

5.2 Technological aspect

In order to accommodate bigger ships, it is necessary for port to enhance its capacity through deepening water depth, enlarging & integrating backyard, introducing machinery with high productivity and further port extension. For Keelung port, if its core business is container operation, not only all these techniques must be implemented but also consider the shift of the operation of general cargo and bulk to its auxiliary port and the removing of military berths to improve its capacity. That is, the so-called ‘resource saving land-management policy’⁴⁵ which pursuits economical use of land resources and optimisation of land utilisation in port area through a specific functionally arranged and spatially suitable use of land adopted by Hamburg as well as Felixstowe should be considered.

On the landside, the bigger ships with high traffic volume back and forth which in line with the booming of operation and economy will result in the deterioration of congestion and pollution and the build-up of new transport system. Viewing from table 7, it is common for cityport to excavate a tunnel or build a bridge even own a dedicated transport system to divert / bypass the traffic (from city centre) resulted from port activities (details see appendix 2).

⁴⁵ . Free and Hanseatic City of Hamburg, (2001), *The port of Hamburg as a Logistics Service Centre – Opportunity of a New Era*, Ministry of Economic Affairs, Hamburg, Germany, pp 25 – 27.

Meanwhile, under the policy of developing environment-friendly transport in Europe, it seems that on-dock rail terminal and intermodal transport are so popular and being encouraging. For Keelung port, in order to alleviate the traffic at East Bank area, the ideas of construction of East Bank Outward Highway or excavation of tunnel connecting two Banks should be conducted as soon as possible. Concerning the 'Rail Intermodal' link project should again be taken into consideration.

Table 7. Traffic condition and modal split in selected ports

Criteria	Keelung	Felixstowe	Marseille	Rotterdam	Hamburg
Intermodal / On-dock rail terminal	–	√	√	√	√
Dedicated road or rail link / tunnel & bridge	▲	√	√	√	√
Modal split(container)	Road : 100 %	Road : 57 % Rail : 14 % Other : 29 %	*Road : 80 % *Rail : 18 % *Other : 2 %	Road : 52 % Rail : 13 % Other : 35 %	Road : 42 % Rail : 19 % Other : 39 %

Notes : '▲' indicates that inappropriate road links in East Bank and lacking of tunnel or bridge connecting East and West Bank. '*' indicates total incoming and outgoing throughput, not only container.

Source: Keelung harbour bureau, footnote 36, www.marseille-port.fr, Port of Marseille Authority, www.hafen-hamburg.de, www.hhla.de, Port of Hamburg, www.portofrotterdam.com

5.3 Economic aspect

It is undeniable that port development is very often viewed as the 'engine' of local economy. In addition to upgrade in local income, job creation is also a direct effect (see table 8). Thus, in certain ports where the city takes a close interest in waterfront activities. For example, the Hafencity scheme⁴⁶ in Port of Hamburg even returns a major area of port land to the city (details see appendix 1).

On the other hand, all improvement in income and economy will lead to the need of recreational use of port area, thus the recreational function (such as the enlargement of marina or establishment of waterfront facilities) should be taken into account when port development program is formulating. Although there is lack of space in extension for Keelung port, the need of recreation from local community could not be neglected,

⁴⁶ . Port of Hamburg, (2000/2001), *Port of Hamburg Handbook*, Ministry of Economic Affairs, Hamburg, Germany, pp 23.

otherwise the relationship between port and community will be destroyed and then oppositions and disputes will exert negative influences on cityport development.

Table 8 : Employment in selected ports (year 2000)

Port Name	Contents
Keelung	<ol style="list-style-type: none"> 1. Number of employment of port authority : 1,174. 2. Number of stevedores : around 1,000. 3. The population was engaged in direct operational service and ancillary service accounts for 24,000 persons, that is 15 per cent of total employment (159,000) in Keelung City.
Felixstowe	Using employment multiplier ratio of 5 ~ 7 : 1 to assess indirectly and induced employment associated with the port, this means the port's 2,000 employee are estimated to indirectly lead to a further 10,000 ~ 14,000 jobs.
Marseille	<ol style="list-style-type: none"> 1. Number of employment of port authority : 1,464. 2. Fos offers jobs for 7,000 people in the zone and 15,000 from to 20,000 off the zone. 3. Indirect and induced employment of other terminals are unavailable.
Rotterdam	<ol style="list-style-type: none"> 1. Number of employment of port authority : 1,150. 2. Indirect and induced employment are unavailable.
Hamburg	<ol style="list-style-type: none"> 1. Employment of port economy (direct) : 46,500 jobs (22,500 forwarding and warehousing; 8,000 others; 10,500 shipping; 5,500 cargo handling). 2. Employment of trade, banking and insurance 22,000; civil service, customs and railway 6,500; port industries 20,000; indirectly dependent 47,500. 3. Total 140,000 jobs depend on the Port of Hamburg.

Source : Keelung harbour bureau, footnote 36, www.marseille-port.fr, Port of Marseille Authority, www.hafen-hamburg.de, www.hhla.de, Port of Hamburg, www.portofrotterdam.com

5.4 Political & legal aspect

Those political views or provision stipulated in the laws are always based upon opinions, the demand of local residents or even politician themselves. Thus, it is no wonder that the cityport development will be influenced by political and legal factors (see table 6). On the other hand, the capacity of the statutory body in port planning and management not only plays an important role in carrying out cityport development but also could mitigate those irrational resistance from politician and local residents and harmonise the relationship among all parties. Therefore, again, an appropriate organisation with clear missions through statutory authorisation is needed for Keelung port development.

5.5 Management & organisation aspect

Checking from table 6, there are three types of port management, the Anglo-Saxon tradition, the Latin tradition and the Hanseatic tradition⁴⁷, existed four selected cityports. It is really difficult to conclude that which type of port organisation and management is the best one that could be adopted by Keelung port. However, the appropriate type should be obtained under deliberation through the co-operation of port and city. On the other hand, instilling new blood and selecting persons who own skills, knowledge and experiences to serve and meet customers' needs through teamwork and building trust and understanding with customers are also important tasks.

5.6 Facilities aspect

Due to limitation in port area and the fierce competition between shipping lines, ports and countries and the possibilities for substituting one port for another are so great⁴⁸, in order to survive and improve competitive position, the 'internal expansion' strategy used by Felixstowe and Hamburg could be adopted by Keelung port. Meanwhile, Under the circumstance of the prevalence of worldwide web network, an on-line integrated information technique system (IT system) between port, customs and shipping industries should be well developed and maintained.

5.7 Service and performance aspect

In addition to the adoption of the technique of 'hardware' – such as deepening and redeveloping old port area, the technique of 'software' in improvement in service and performance should also be valued. The concept of 'customer first' is the first thing should be set up while the style of bureaucracy should be discarded. At present, customer service and satisfaction are fundamental to any successful long-term partnership. Thus, the quality of service, the efficiency in operation and the concept of 'customer first' should be recognised and implemented by all levels of employee.

⁴⁷ . Douglas K. Fleming & Alfred J. Baird, (1999), "Some reflections on port competition in the United States and western Europe", *Maritime Policy and Management*, 26(4), pp 383 – 394. The Anglo-Saxon tradition of independent port authorities must be distinguished from both the centralised Latin tradition in France, Spain and Italy and the municipal Hanseatic tradition that prevails in Germany, Holland and Belgium.

⁴⁸ . F. Suykens & E. Van De Voorde, (1998), "A quarter of a century of port management in Europe : objectives and tools", *Maritime Policy and Management*, 25(3), pp 251 – 261.

Chapter 6 Conclusion

In this project, the relationship between cityport development and its local impacts around the Keelung City area has been discussed widely. As to most of the effects of all factors which can influence cityport development vary from economic to political to management and service and could not be quantified in an appropriate way, it is therefore that the conventional mathematical techniques, such as cost and benefits analysis is not be used in my analysis. Instead, through the development of a conceptual model and case study approach, they not only dealt with the difficulty mentioned above and proved the inter-relation between external and internal factors, but also provided useful alternatives for target port by reviewing and comparison from selected so-called advanced cityports.

On the other hand, concerning all alternatives, which should be taken into account by Keelung port in future development, could be summarised as follows.

- For the sake of solving all disputes related to cityport development, urban transportation planning and land use policy which existed between port and local community, hand-in-hand with Keelung City Government and setting up an overall planning committee or similar organisation is necessary.
- In order to alleviate the traffic burden at East Bank area and divert the traffic resulted from port activities, the alternatives of excavating a tunnel or building a bridge connecting West and East Bank or even construction of a dedicated transport link (such as East Bank Outward Highway) and intermodal transport all needed to be re-valued.
- In line with the intention in developing as a container port and the need of local community in improvement in quality of life (such as fresh air, no traffic congestion and recreation use), the ideas of shift of the operation of general cargo and bulk to its auxiliary port should also be implemented.
- Due to the limitation in port extension, in order to maintain its competitive edge, not only should the port enhance its capacities through deepening channel and berths, 'internal expansion' in redeveloping old port areas and introducing machinery with high productivity, but also should the port pay more attentions to the quality of service and the efficiency in operation, the establishment of the concepts of 'customer first' and 'teamwork' and the improvement in information technique system innovation.

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Appendix 1. Comparison 1 – Basic information

Port name	Contents
Keelung	<ol style="list-style-type: none"> 1. The 27th largest container port in the world, the 3rd largest port in Taiwan. 2. Ownership : Government . 3. Management : <ol style="list-style-type: none"> (1). Statutory body : Keelung Harbour Bureau (KLHB). (2). Planning : KLHB. 4. Operation : <ol style="list-style-type: none"> (1). Container : KLHB. (2). General cargo and bulk : private sector. 5. Port extension : <ol style="list-style-type: none"> (1). New port project has been suspended. (2). No place to extend in port area. (3). Dredging program in main channel and berth are under proceeding. (4). Encouraging the operation of general cargo and bulk shifting to Taipei port. (5). The demand of remove of military berths. 6. Disputes : <ol style="list-style-type: none"> (1). Traffic congestion and environmental pollution. (2). Filling and levelling part of inner port to create space for recreation use.
Felixstowe	<ol style="list-style-type: none"> 1. The 17th biggest container port in the world, the leading container port in UK. 2. Ownership : Hutchison Port Holdings. 3. Management : <ol style="list-style-type: none"> (1). Statutory body and planning : FD & RC (the Felixstowe Dock & Railway Company) . (2). Navigation : HHA (Harwich Haven Authority). 4. Operation : Hutchison Port Holdings. 5. Port extension : <ol style="list-style-type: none"> (1). Under the 1968 Act, port could be extended. (2). Under the 1988 Act – statutory port limit, protected sites of special scientific interest (SSSI) border the port. (3). No place to extend in port area. (4). Alternatives for port extension – redeveloping order areas, rationalisation of back up land and implementation of 3Ps strategies, acquisition of Thamesport and Harwich. (5). Dredging program in main channel (to –14.5 metre) was finished. (6). The port is far from urban area, no recreational needs. 6. Disputes : environmental protection .
Marseille	<ol style="list-style-type: none"> 1. The 1st largest port in France. 2. Ownership : Central Government. 3. Management : Port of Marseille Authority. 4. Operation : Private companies. 5. Port extension : <ol style="list-style-type: none"> (1). During the early of 20th century, the idea of south- or north extension has been argued under pressure from local community and politician under the consideration of urban development. (2). Except the Eastern Harbour Area, the PMA has acquired new lands to the north of initial boundary, now known as Western Harbour Area which includes Lavera, Fos and Port-Saint-Louis du Rhone. In Lavera and the area between Fos and Port-Saint-Louis, there are land available for further extension. (3). The old port area – Le Vieux Port was largely devoted to pleasure craft. 6. Disputes : <ol style="list-style-type: none"> (1). Before: urban development and environmental protection. (2). Now: no adverse party to the port development but every project is bound by strict rule (national law in matter of environment and respect of area-users (fishers, national parks)).
Rotterdam	<ol style="list-style-type: none"> 1. The 5th largest container port in the world, the leading port in Holland and Europe. 2. Ownership : City Municipality 3. Management and operation : <ol style="list-style-type: none"> (1). the Rotterdam Municipal Port Management : the development, construction, management and operation of the port and industrial zone; the effective, safe and efficient management of shipping traffic. (2). private enterprise, such as container stevedore company ECT.

Rotterdam	<p>4. Port extension :</p> <p>(1). In 1970s, the project of Europoort was suffered pressure from environmental groups, local community and politicians and had prompted a political decision placing limits on the port's extension.</p> <p>(2). However the port has extended from Botlek→Europoort→Maasvlakte and now the construction of Maasvlakte phase II is under controversial but said to be dealt with in the year 2001.</p> <p>(3). The Maasvlakte phase II links with the developing of a 350 ha nature & recreational uses.</p> <p>(4). 75 foot : ships with draft of up to 75 foot can enter the port fully loaded.</p> <p>6. Disputes : environmental protection and recreational uses.</p>
Hamburg	<p>1. The 9th largest container port in the world, the leading port in Germany.</p> <p>2. Ownership :</p> <p>(1). Infrastructure : the City-State of Hamburg (such as quay walls, sites, road, rail lines and bridges).</p> <p>(2). Superstructure : private enterprises (such as sheds, van carriers, gantry cranes, forklift trucks).</p> <p>3. Management : the Ministry of Economic Affairs (includes port development, building and maintaining infrastructure).</p> <p>4. Operation : private sectors, such as the leading operator HHLA (Hamburger Hafen- und Lagerhaus-Aktiengesellschaft)</p> <p>5. Port extension :</p> <p>(1). The State appreciated the importance of the port to the local and national economy and accepted the need for large investment in infrastructure.</p> <p>(2). The Hamburg Senate has at all time maintained large reserved of lands for port use – positive long term approach has been adopted to ensure the continuing viability of the port.</p> <p>(3). Using external expansion policy involves identifying and establishing new areas for port use while using internal expansion (resource-saving land-management policy) sees existing port areas being restructured and infilling redundant harbour basins for new uses.</p> <p>(4). The HafenCity scheme will establish a direct link between Hamburg's city centre and its historic waterfront by returning a major area of port land to the city. It will include residential accommodation, offices, retail space, leisure facilities, a marina for historic ships and a purpose-built cruise ship terminal.</p> <p>(5). In the year 2001, free port area in utilised areas is 1,620 ha while there is still 215 ha in preparation for port use in extension area.</p> <p>(6). Dredging to –16 metre to ensure VLCC and mega container ships can be loaded and unloaded whatever the state of tide.</p> <p>(7). By 2003, the port will have eight new berths in Altenwerder (Europe's most modern freight-distribution centre, an intermodal rail terminal).</p> <p>6. Disputes : urban environment (growing demand for high quality land for residential purposes, offices, cultural, tourist facilities, transport or other economic functions).</p>

Source : Keelung harbour bureau, footnote 36, www.marseille-port.fr, Port of Marseille Authority, www.hafen-hamburg.de, www.hhla.de, Port of Hamburg, www.portofrotterdam.com

Appendix 2 : Comparison 2 – Traffic conditions and modal split

Port Name	Contents
Keelung	<ol style="list-style-type: none"> 1. Connecting Super Highway No.1 through two elevated motorways for each Bank. 2. Connecting Super Highway No.2 through West Bank Outward Highway. 3. Chung Cheng road serves traffic at East Bank while Chung Shan road at West Bank. 4. Almost 99 per cent of throughput transported by road. 5. There is a dispute in removing on-dock rail serving in general and bulk terminals.
Felixstowe	<ol style="list-style-type: none"> 1. Construction of A14 between the port and A45 trunk road at Trimley thus bypassing the town of Felixstowe. 2. A1-M6 road link upgrades the entire route between the port and the M1/M6 junction now consists of dual carriageway. 3. Rail terminal uses Trimley Rail Line. 4. In 1997, for container, 57 per cent were transported by road, 14 per cent by rail and 29 per cent by container feeder or ro/ro service.
Marseille	<ol style="list-style-type: none"> 1. The Boulevard de Plombieres which links the northern motor with the Jarret by-pass, is supported along much of its length by a viaduct. 2. The coastal motorway links various terminals of the northern port area passes above the Lazaret-Joliette Quays and connects the northern and southern parts of the city by means of a motorway tunnel under the Vieux Port. The northern motorway follows an elevated direct line from the Place Jules Guesde to the Canet interchange, largely ignoring the pre-existing street pattern and reduces considerably the problems of urban regeneration. 3. The eastern harbour is located inside the town, it is difficult to estimate the congestion generated by the port itself. 4. There is a link between the main railway network and the private plot. 5. The ratio concerning the incoming and outgoing throughput : 18 per cent by rail, 80 per cent by road and 2 per cent by inland waterway.
Rotterdam	<ol style="list-style-type: none"> 1. Two well equipped rail service centres and two rail chemical centres while many terminals have their own rail connection (on-dock terminal). 2. In 1998, for container, 52 per cent were transported by road, 13 per cent by rail and 35 per cent by barges.
Hamburg	<ol style="list-style-type: none"> 1. The provision of direct motorway access to harbour area involves taking vehicles over and under the Elbe (bridges or tunnels). 2. Access by road was greatly facilitated by linkage to the main motorway network (E45, E22) and the construction of new routes (such as the building of a new link between the E22 and the E45). 3. The largest rail terminal handling centre in Europe. 4. Rail junctions : five long distance links and two regional lines (such as Europgate Intermodal offers combined road-rail transport service to destination in Austria, Croatia, the Czech Republic, Hungary, Romania, the Slovak Republic and Slovenia). 5. In 1998, for container, 42 per cent were transported by road, 19 per cent by rail and 39 per cent by barges or feeder transshipment.

Source : Keelung harbour bureau, footnote 36, www.marseille-port.fr, Port of Marseille Authority, www.hafen-hamburg.de, www.hhla.de, Port of Hamburg, www.portofrotterdam.com