Technical Report 4.14:

Impact Assessment of Road 1-4
and Proposed Development on Jiading Wetlands
Strategic Plan for Jiading Economic Development

技術報告 4.14：1-4 號道路暨茄莞濕地相關開發計畫之影響評估

茄莞經濟發展之策略計畫

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2014 年 六月

Executive Summary

This technical report presents the research that was conducted by the University of California, Berkeley and SAVE International to evaluate the importance of Jiading Wetland for the survival of the Black-faced Spoonbill (*Platalea minor*) and other wild birds in the East Asian Australasian Flyway, to determine the impacts of Road 1-4 on these birds if it went through the wetland, and to assess the adequacy of the EIA for Road 1-4. As the research was being conducted, the evidence suggested that it was also essential to consider the economic development potential for the Jiading area and especially the costs and benefits to Jiading and Qilou Villages if the entirety of the Jiading Wetland is preserved for wildbird habitat as well as ecological and cultural tourism. This report answers the following questions:

1. Is Jiading Wetland essential for the survival of the Black-faced Spoonbill and other birds?
2. What are the impacts of Road 1-4 on these birds and does the EIA for Road 1-4 adequately address these impacts?
3. What are the economic development potentials for Jiading and Qilou if the entirety of the wetland is protected from further road construction and development?

Primary Conclusions

The research team reached consensus on the following points:

1. Jiading is a wetland of international importance. It qualifies as a Ramsar site by multiple criteria, and explicitly because of the numbers of Black-faced Spoonbills that now winter there. It is also important as a seasonal site for migratory birds along the East Asian Australasian Flyway, and for an unusual diversity of species specific to coastal and inland areas of Taiwan. Jiading Wetland also qualifies for protection under Taiwan's Wetland Conservation Act. However the EIAs for Road 1-4 do not consider the implications of meeting the requirements of this law. Can the road legally be built? We argue that the wetland should be reclassified due to its species diversity and presence of the Black-faced Spoonbill. If it were to be reclassified to a Wetland of National Importance, Road 1-4 could not be constructed through the wetland. The scientific team concludes that Jiading Wetland is critical for the Black-faced Spoonbill to recover from its extinction vortex and attain a sustainable population. For this reason alone, Road 1-4 should not be built through the wetland.

2. The various EIAs for Road -4 are alarmingly flawed. The EIAs present a lot of information in superficial form about the details of construction to justify building Road 1-4 without presenting essential scientific evidence. The EIA fails to consider the dramatic changes that have occurred in and around the wetland since Road 1-4 was originally proposed – changes that obviate the need for the road – namely harbor expansion that has been less than successful, multiple land use plan updates that reduced the level of allowable development in and around the wetland, resulting lower expected traffic volumes as well as lack of evidence of traffic problems.

The EIAs also fail to consider the recent increase in the number of spoonbills and wildbirds inhabiting the wetland. They do not use the best available scientific evidence of conservation biology and field studies regarding the spatial requirements for Black-faced Spoonbill habitat. The lack of this evidence makes it impossible for the EIA committee to make a scientifically-based decision regarding the impact of the fragmentation of areas B1 and B2 and the results of the island effects on the spoonbill populations. Further, the EIAs rely on anecdotal observation that roads have no effect of spoonbills that cannot be mitigated because spoonbills continue to use Jiading Wetland after Roads 1-1 and 1-6 were built. This observation confuses the known research about spoonbill scare distance when roosting and foraging. In preferred habitat spoonbills seldom roost closer to roads, people, or dogs than 200 meters and prefer 500-700 meters. When foraging, the Black-faced Spoonbill are more alert and less vulnerable and will tolerate closer scare distance, especially if there is an abundance of food, and then only for a short time. Prime roosting habitats will be rendered unusable if Road 1-4 is built. The EIA does not address this.

Further, the primary purpose of an EIA is to assess environmental impacts not administrative issues. The present EIA attends to mostly administration and construction issues not the intended purpose of an EIA. The EIA ranking system appears to be calculated to conclude that the best alternative is directly through Jiading Wetland, but even this ranking, without proper weight for the negative impact on sustainable economic development potential or the loss of habitat for an endangered species, concludes that there is insignificant advantage to Road 1-4 being located through the wetland. The EIAs are insufficient in demonstrating the need for a road do not accurately analyze all potential environmental and economic impacts. The bias of the current EIA towards constructing a road does not give a "no-build" scenario equal weighting or assessment. For reasons of inadequacy alone, Road 1-4 should not be built through the wetland.

3. Based on field research conducted in 2013 and 2014 it is now known that the Black-faced Spoonbill uses the entire site of Jiading Wetland and Yong-an Wetland to the south. At Jiading this includes not only the area north of Road 1-4 but also south of Road 1-1; areas defined as B5, A5, and A2.

Further, the entire site consisting of B1, B2, B3, B4, A3, A1, B5, A5, and A2 is comparable in size to other best winter sites where Black-faced Spoonbills use the entire site to roost and forage, making the conservation of the entirety of Jiading Wetland, north and south of Road 1-1 essential for the survival of a sustainable population of spoonbills and other wild birds. If parts of the wetland are rendered unusable for spoonbill foraging and roosting (either by dividing B1 and B2 into areas too small; developing B5, A5, or A2 for recreation villas or other intensive use; or by failing to protect habitat in Yong-an Wetland) the spoonbill will suffer, other bird populations will be reduced, and unique ecotourism opportunities will be lost. For these reasons Road 1-4 should not be built through Jiading Wetland. Further, the wetland areas south of Road 1-1 (B5, A5, and A2) should be protected from development. Anticipated development should be located in underused areas at the harbor near Love Pier to take advantage of better water access and to create a critical mass of economic activity at the harbor in order to stimulate development that has yet to materialize.

4. If Jiading Wetland is preserved in its entirety, this area has unique regional advantages for creating a vigorous, sustainable economy of cultural and ecotourism to supplement the existing fishing economy. These advantages include Jiading's easy access from both Tainan and Kaohsiung for regional weekend getaways to natural attractions from the city; the best access from the high speed train stop to get to prime Black-faced Spoonbill habitat for Taipei visitors, international travelers, and bicyclists; and unmatched local attractions including bird watching stations, a mangrove trail, a weapon museum, the tomb of Ning Jin King, environmental education at Wu Sha Lin salt office, the Yong-an salt workers village, a seaside park, temple festivals, day and night markets, the puppet show, fish market, old harbor port, the ship burning festival, among others.

Because of its adjacency, Qilou Village will likely be a primary economic beneficiary of preserving the entirety of Jiading Wetland. Qilou Village is the logical location for visitor-serving facilities including overnight accommodation, guides for exclusive tours to Jiading Wetland, boat tours to the harbor, mangrove forests, fishing trips, and the Yong-an Wetland area.

These economic advantages depend on protecting Jiading Wetland from further development. If Jiading hopes to capitalize on the growing ecotourism industry in Taiwan, the community would be remiss in building Road 1-4 through the Jiading Wetland.

For these reasons Road 1-4 should not be built through Jiading Wetland. These economic advantages far outweigh any benefits of Road 1-4; further the negative impacts of Road 1-4 undermine the benefit potential.

行動綱領

本報告由美國加州大學柏克萊分校(University of California, Berkeley)和國際黑面琵鷺後援聯盟(SAVE International)共同完成。旨在評估茄萣濕地對於黑面琵鷺(*Platalea minor*)及其他東亞－澳洲候鳥遷徙路線(East Asian Australasian Flyway)上之野生鳥類的重要性，並檢討計畫穿越濕地的高雄市茄萣區 1-4 號道路（莒光路南段）對濕地和棲息其中的鳥類之潛在影響，並檢討【茄萣區 1-4 號道路（莒光路南段）開闢工程環境影響說明書】之合理性。經本團隊研究，認為相關評估及計畫有必要同時考慮茄萣未來經濟發展的潛力。特別應在將茄萣濕地作為野生鳥類棲息地而得以被完整保育，並以生態和文化旅遊為發展目標之情境下，就茄萣區和崎漏里進行規劃及本益分析。**本報告旨在闡述與回應下列三個問題**：

1. 對於黑面琵鷺和其它鳥類的生存而言，茄萣濕地是否是不可或缺的？
2. 1-4 號道路將如何影響這些鳥類？環境影響說明書是否充分地指出了這些影響？
3. 如果未來茄萣濕地可排除道路建設的影響並保持其完整性，則茄萣區和崎漏里的經濟發展潛力如何？

初步結論

研究團隊提出以下共識：

1. 茄萣濕地具有國際意義。茄萣濕地符合《拉姆薩國際濕地公約》（《特別是作為水鳥棲息地之國際重要濕地公約》）中所提出的多項國際重要濕地評價標準，並因數量眾多的黑面琵鷺在此度冬而更形重要。茄萣濕地也是東亞－澳洲遷徙路線上鳥類的季節性棲息地，並呈現罕見的生物多樣性。茄萣濕地同時也符合台灣《濕地保育法》之劃設標準，應受到該法規的保護。然而，1-4 號道路的環境影響評估卻未考量濕地保育法之規範。那麼，這條道路的建設是否合法呢？考量茄萣濕地的生物多樣性及其存在黑面琵鷺的事實，研究團隊認為茄萣濕地之分級應重新評定。如果茄萣濕地被重新評選為國家級重要濕地，那麼 1-4 號道路將無法按照原計畫穿越濕地。研究團隊透過科學分析指出茄萣濕地對於黑面琵鷺遠離滅絕危機並維持永續的族群數量有著至關重要的意義。光就茄萣濕地對黑面琵鷺和其他鳥類的重要意義而言，1-4 號道路就不應穿過此一濕地。

2. 關於 1-4 號道路環境影響說明書中各版本的替代道路方案皆存在嚴重的漏洞。該說明書對環境影響的評估呈現了很多表面性的訊息以證明開闢 1-4 號道路的合理性，但卻未能提供關鍵性的科學證據。首先，環境影響之評估未考慮到 1-4 號道路計畫自提出以來，茄萣濕地內部及其周邊已發生巨大變化。起初，1-4 號道路是為了配合興達港擴張而規劃的；

然而，至今興達港的發展並不成功，且日後經變更之茄萣都市計畫內容開始對茄萣濕地進行保育，限制濕地內部和周邊的都市開發。據此，茄萣濕地周邊的交通量將低於原先所預期，則出現交通問題的可能性也大大降低，1-4 號道路的設置也因此變得並非必要。

各版本的替代道路方案也未考慮近期在茄萣濕地內棲息的黑面琵鷺等野生鳥類數量增加的事實。且其未採納現有最佳的、有關黑面琵鷺棲地空間需求的保育生態學知識和田野調查得出的證據與結論。對這些證據的忽視將導致環境影響評估委員會無法就棲息地破碎化和生態孤島效應對黑面琵鷺族群的影響作出科學性的決策。此外，環境影響說明書中僅憑片面的觀察即認為道路對黑面琵鷺的遷徙不會產生影響，又特別提出在 1-1 號道路和 1-6 號道路建設完成後，黑面琵鷺仍繼續使用茄萣濕地的現象。然而，這樣的論點卻有悖於既有的研究結果。現有的研究認為黑面琵鷺在棲息和覓食時，需要與可能驚嚇其自身的事物保持一定的距離。在理想的狀況下，黑面琵鷺幾乎不會在距離道路、人、或狗 200 米的距離範圍內棲息，通常安全距離應達 500-700 米。在覓食時，特別是在食物資源豐富、但覓食時間有限的情況下，黑面琵鷺對於周邊環境的敏感度會提高，但能容忍、縮小警戒距離。如果 1-4 號道路按照原計畫建設，那麼茄萣濕地如此重要的鳥類棲息地將受到極大的影響。然而環境影響說明書中並未強調這方面的問題。

此外，環境影響說明書理應指出實質的環境影響衝擊，而非行政方面的問題。目前環境影響說明書內容強調行政和建設方面的問題，有悖於環境影響評估本身的初衷。又其所採用之環境影響評估評分方式只是迎合了穿越茄萣濕地的道路設計方案，卻未能考慮到道路對未來經濟發展和茄萣濕地的負面影響。然而經此評分方式計算後，1-4 號道路穿越茄萣濕地的益處並不明顯。這些環境影響評估不僅未能有效證明開闢 1-4 號道路的必要性，也未能準確地指出潛在的環境和經濟影響。由於現有環境影響評估結果傾向於有必要興建 1-4 號道路，甚至未對不建設 1-4 號道路的情境進行分析和評估。單就環境影響說明書中此多不當之處而言，1-4 號道路就不應穿越茄萣濕地。

3. 根據 2013 年和 2014 年現地調查的結果可知，整個茄萣濕地和其南邊的永安濕地均為黑面琵鷺所利用。在茄萣濕地中，黑面琵鷺棲息在 1-4 號道路的兩側，它們所在的區域具體包括了 B5、A5、A2。

   茄萣濕地中的 B1、B2、B3、B4、A3、A1、B5、A5、A2 區域之加總面積與黑面琵鷺度冬所需要的棲息地面積相當。因此，茄萣濕地的整體保育，特別是 1-1 號道路兩側區域的保育顯得特別重要。這些區域是黑面琵鷺和其他野生鳥類族群得以繁衍生息的關

鍵。如果將 B1 或者 B2 區域切割為更小的區域，或者將 B5、A5、A2 建設成渡假村或是進行高強度的開發，抑或是無法成功保育永安濕地，那麼部分濕地會因此喪失原有的功能，導致黑面琵鷺無法在此處棲息和覓食。黑面琵鷺和其他鳥類的族群數量將因此受到影響，茄萣地區也將失去發展生態旅遊的機會。基於以上原因，1-4 號道路不應該穿越茄萣濕地。此外，1-1 號道路南側的部分濕地（B5、A5、A2）不應被開發。原擬計畫開發的項目應規劃配置在情人碼頭附近尚未開發的區域，理當充分利用當地水岸特色，形成一定規模的經濟活動，以刺激該區域之開發。

4. 茄萣濕地的整體保育將有助於當地發展具有活力、可持續的，以文化和生態旅遊為主體的經濟模式。此一經濟模式也能補充現有在地漁業經濟產值不足的困境。而茄萣在發展文化和生態旅遊方面也有著區域性的優勢。首先，茄萣鄰近台南和高雄，是週休二日理想的自然旅遊目的地。其次，在台灣各主要的黑面琵鷺棲息地中，茄萣濕地至高鐵車站的交通最為方便，此有助於茄萣濕地吸引來自台北之島內、島外遊客及自行車騎者。此外，茄萣濕地還擁有獨一無二的地方旅遊資源，例如茄萣濕地公園的賞鳥亭、白砂崙紅樹林步道、兵器博物館、明寧靖王墓、原烏樹林製鹽株式會社辦公室(高雄市定古蹟)、永安濕地教育中心、永安鹽田鹽工宿舍群、海濱公園、寺廟節慶、早市和夜市、布袋戲、魚市、舊漁港、王船祭等。
5. 由於崎漏里緊鄰茄萣濕地，完整保育茄萣濕地將可為崎漏里帶來顯著的生態旅遊經濟利益。崎漏里是設置旅遊服務設施的理想地點。聚落內可提供住宿、導覽、遊船觀光、捕魚等旅遊服務，而且紅樹林生態景觀和永安濕地也是很好的旅遊資源。然而這些都是建立在茄萣濕地得以保育、免於進一步開發的基礎上的。如果茄萣希望在台灣日益成長的生態旅遊市場中佔有一席之地，那麼對於 1-4 號道路穿越茄萣濕地之建設計畫應進行慎重的考慮。

基於上述原因，1-4 號道路不應穿越茄萣濕地。完整保育茄萣濕地可能帶來的經濟利益將超過開闢 1-4 號道路所帶來的效益。如果 1-4 號道路穿越了茄萣濕地，那麼這些潛在的利益也將不復存在。

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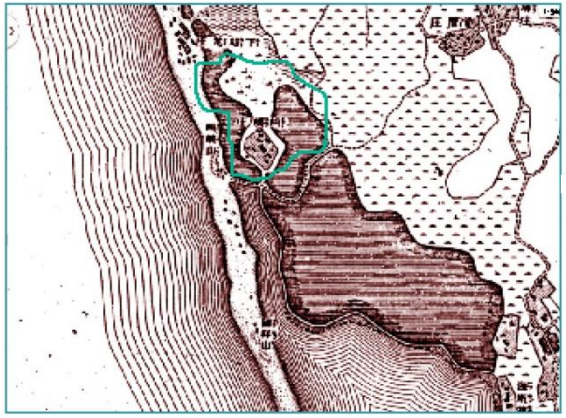
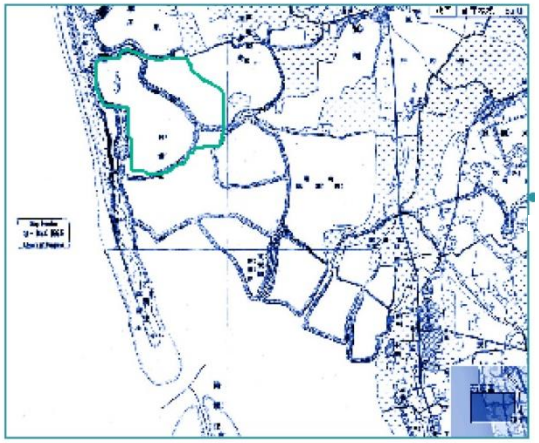




History of Jiading Wetland

1636 For a long time the Pingpu Tribe lived in this area, with records dating back to literature written over 380 years ago. A Dutch map created in 1625 shows fishermen settlements in Jiading area. Note the larger lagoon and extensive, natural wetlands. For hundreds, maybe thousands of years, people relied on the natural environment of Jiading Wetland area without dramatically changing the ecosystem.

1665 Saltpan was first introduced in Taiwan under Qing dynasty of China.

1895 Japanese colonial period: 1895-1945. Map shows paddy fields in the east of Jiading Wetland. Parts of Jiading appear to be part of Jao-Kang Lagoon. Barrier islands have shifted.

1898 Saltpan was expanded by the colonial government. 1936 records indicate that some fish ponds were bought and converted to saltpan.

Post-1949 Salt production continues until 1970s. Salt workers continue to live in Wu Shu Lin, the salt worker village next to Yong-an Wetland.

1971 Jhuhu Salt Pan stops production when Xingda Harbor is established.

1977 Road 1-4 first appears on the national land use map for Jiading District.

2007 Jiading Wetland designated a wetland of local importance.

2011 Ministry of Interior approves establishment of Jiading Wetland Nature Park.

2012 Road 1-1 opened as part of Xingda Harbor expansion. Dredge spoils deposited in Jiading Wetland.

2013 First EIA for Road 1-4. Wetland Conservation Act passed. Black-faced Spoonbills first recorded in significant numbers in Jiading and Yong-an Wetlands.

茄萣濕地的歷史

1636 年，距今超過 380 年的史料中記載，平埔族部落曾在此地區長期生活。荷蘭人於 1625 年所繪製的地圖中顯示茄萣地區已存在漁村聚落，且當時的茄萣有著比現今面積更大的潟湖和自然濕地。數千年來，人們與茄萣地區的自然環境和諧共生。

1665 年，清朝期間，鹽田產業首次引入台灣。

1895 年，日治時期（1895-1945 年）的地圖中顯示在茄萣濕地以東的區域被開發為水稻田。部分曾為潟湖之區域於此時期轉變為陸地，原先的地貌發生了巨大變化。

1898 年，日本殖民政府擴張鹽田面積。1936 年的紀錄顯示，一些魚塭被日人購買並改闢為鹽田。

1949 年後，此地區的鹽業生產仍然持續，直到 1970 年代。日後鹽工繼續居住在烏樹林鹽場周邊，包括位於現今永安濕地旁的鹽工宿舍。

1971 年，竹滬鹽田停止產曬，興達漁港約在同時期落成。

1977 年，1-4 號道路首次出現在茄萣區的土地利用計畫中。

2007 年，茄萣濕地由營建署指定為地方級重要濕地。

2011 年，台灣行政院內政部營建署通過建設茄萣濕地公園之決定。

2012 年，1-1 號道路落成，並作為興達魚港擴張之部分建設。興建 1-1 號道路過程中挖掘的廢棄物被棄置於茄萣濕地中。

2013 年，【茄萣區 1-4 號道路（莒光路南段）開闢工程環境影響說明書】完成。同年，《濕地保育法》通過。在茄萣濕地和永安濕地第一次紀錄到數量可觀的黑面琵鷺。

Introduction

Jiading (Qieding) Wetland, located 11.5 km south of Tainan City and 40.8 km north of Kaohsiung City, is surrounded by a port, a village, fish and dryland farms. The wetland is also an important connective core habitat. The 171 hectare wetland is home to over a hundred species of birds including 5.5 % of the global population and 9.5% of Taiwan's population of the endangered Black-faced Spoonbill (*Platalea minor*).

In recent years Taiwan has gained international recognition for its efforts to protect and create new habitats for the spoonbill. As a result spoonbill numbers are increasing, meaning that more protected habitat is required. Jiading Wetland is one of the most recent sites that the Black-faced Spoonbill inhabits in significant numbers. For this reason the wetland, currently designated as a Taiwan Wetland of Local Importance, qualifies as a wetland of international importance according to the 1971 Ramsar Convention on Wetlands, which can be bestowed upon a site supporting at least 1% of an endangered species.

For the above reasons Jiading Wetland should be protected, expanded, and managed for habitat and ecological benefits. Yet it is the site of on-going controversy. There was a fight when Road 1-1 was built through the wetland. Even though there were few spoonbills at the time there were many other waterfowl. Designating Jiading a wetland park in 2011 provoked the anger of local land owners hoping to develop. The proposed Road 1-4, on the books since the first official plan for the Jiading District of Kaohsiung City in 1977, is the current battleground. At that time, portions of Jiading Wetland were slated for development. Even though the development once contemplated is no longer in the official plan and the current plan shows Jiading Wetland as a wetland park, the plan continues to show Road 1-4 running through the wetland.

During the last election various politicians supported the construction of Road 1-4, including Kaohsiung Mayor Chen. Critics of Road 1-4, however, believe the road would damage the ecological health of the wetland, diminish its value as habitat, and curtail Jiading's potential to attract environmentally-friendly tourism activity and related facilities. Further, the assessment of the impacts of the road has been found inadequate. Road 1-4 has undergone two Environmental Impact Assessments (EIAs) one in February 2013 and more recently in January 2014. Both EIAs briefly address a "no-build" scenario, the proposed plan, and several alternatives. However, the EIA does not ask the question of whether the road is necessary. The EIAs also fail to adequately analyze the potential impacts on the wetland and the Black-faced Spoonbill or potential benefits from either an alternative route or not building the road at all. Additionally, whether Road 1-4 could ever be built as proposed is not clear given the recent passage of the Taiwan Wetland Conservation Act.

Method of Study

The purpose of this report is to present the results of an investigation to determine the significance of the Jiading Wetland in Taiwan's wetland system and the wetland's importance to the survival of the Black-faced Spoonbill, and to evaluate the adequacy of the EIA for Road 1-4. The report also establishes the importance of the Yong-an Wetland (once part of the same wetland that surrounded Jao-Kang Lagoon before it was altered to build the Xingda Harbor) to a sustainable population of spoonbills and other species. Finally the report proposes a local economic development strategy to capitalize on the tourism potential of the wetland.

The study was conducted as a joint research effort between the University of California, Berkeley, Department of Landscape Architecture and Environmental Planning; and SAVE International (Spoonbill Action Voluntary Echo). The research consisted of an extensive review of the environmental impact assessment for Road 1-4, official plans for the Jiading District and the region, case studies from elsewhere in the world where a road was terminated to protect wildlife, research into the relative importance of Jiading Wetland by international standards, on-site field research to determine precise Black-face Spoonbill use of Jiading Wetland for roosting and foraging; interviews and a workshop with local residents to catalogue the potential for cultural and ecological tourism, an assessment of the population and economic trends to determine causes for the continued under-utilized harbor and possible solutions, and meetings with central government officials to assess the effectiveness of national wetlands policy in terms of conservation.

引言

茄萣濕地位於台南市以南 11.5 公里、高雄市區北邊 40.8 公里處，主要由漁港、集村、魚塭、農田所構成。茄萣濕地是重要的生態節點，面積達到 171 公頃，是百餘種鳥類的家園，其中包括了國際級瀕危鳥種黑面琵鷺（Platalea minor）。於茄萣濕地度冬的黑面琵鷺數量分別占世界總數的 5.5%，以及台灣總數的 9.5%。

近年來，台灣在黑面琵鷺棲地保育和營造方面的努力成果受到國際肯定。由於黑面琵鷺的數量有所增加，對棲息地數量和面積的要求也隨之增加。而茄萣濕地恰好是最新發現的、棲息了大量黑面琵鷺的棲地之一。根據《拉姆薩國際濕地公約》，當棲息地所棲息的瀕危物種數量超過其族群總數量之 1%時，此一棲地即具有國際級的重要性。因此，茄萣濕地應從台灣地方級重要濕地提升為國家級重要濕地。

茄萣濕地應從生態的角度出發，進行妥善的保育與管理。然而，茄萣濕地正上演一場論戰，當 1-1 號道路穿越濕地而建時，這樣的論戰即已展開。當時，茄萣濕地中黑面琵鷺的數量較少，而其他水鳥的數量較多。2011 年，茄萣濕地公園的開闢計畫觸動了許多支持濕地開發之土地所有人的神經，並投身到茄萣濕地道路開發與保育的論戰中來。而當下這場論戰的核心就是計畫中的 1-4 號道路。這條道路於 1977 年首次在高雄市官方的都市計畫中被提出。當時，部分茄萣濕地被計畫作為開發使用。然而，隨後的都市計畫中這些開發項目幾度變更。目前的都市計畫則將茄萣濕地作為濕地公園使用。而 1-4 號道路則在此版本的都市計畫中仍予以保留。

在上一輪的台灣地方首長選舉中，包括高雄市長陳菊在內的眾多政治人物都表態支持開發 1-4 號道路。然而，對於 1-4 號道路的反對意見則認為這條道路將損害茄萣濕地的生態功能，降低濕地作為棲息地的價值，並進一步影響茄萣作為生態旅遊目的地的潛力。此外，1-4 號道路的環境影響說明書中存在有許多不當之處。在 2013 年 8 月、10 月和 2014 年 2 月，1-4 號道路分別進行了三次環境影響說明書之專案小組審查會議。歷次環境影響說明書版本均簡單描述了維持現狀的“零方案“，穿越茄萣濕地的原方案，以及數個替代方案。然而，這些環境影響評估並沒有回答 1-4 號道路是否必要這一根本性問題。這幾個環境影響評估也沒有充分地分析原方案和替代方案對茄萣濕地和黑面琵鷺可能帶來的利弊。最後，考慮到《濕地保育法》的通過，1-4 號道路是否能夠合法地按照原計畫開闢還有待質疑。

研究方法

這份報告通過研究調查，希望達到以下目的：展現茄萣濕地在台灣濕地系統中的重要性；評估茄萣濕地對黑面琵鷺族群繁衍的意義；檢討 1-4 號道路環境影響說明書的合理性。這份報告同時也指出了永安濕地（在修建興達漁港之

前，永安濕地與茄萣濕地相連，並共同環繞蟯港內海）對黑面琵鷺和其他族群繁衍的重要性。最後，這份報告為茄萣濕地提出了以旅遊產業為基礎的地方經濟發展策略。

這份報告是美國加州大學柏克萊分校景觀建築與環境規劃系以及國際黑面琵鷺後援聯盟（SAVE International）共同研究的成果。這項研究包括了對於 1-4 號道路環境影響說明書、茄萣區及區域內市鎮都市計畫的檢討，分析了國外終止道路建設以保護野生動物的案例，按照國際標準判讀了茄萣濕地的重要性，並通過田野調查較為準確地了解黑面琵鷺在茄萣濕地中棲息與覓食的情況。這項研究也與當地居民展開訪談與合作，探討了茄萣地區發展生態和文化旅遊的潛力，同時評估了人口和經濟變化趨勢以分析興達港發展不利的原因及可能的解決方案。最後，研究人員還與中央政府人員會面，探討了台灣濕地保育法對濕地保育方面的作用。

Spatial Dimensions of Black-faced Spoonbill Habitat

The basic habitat requirements for the Black-faced Spoonbill are well documented. Those most relevant to Jiading Wetland and Road 1-4 include: scare distance and habitat fragmentation of winter habitat.

Black-faced Spoonbills have an unusually long scare distance especially when roosting. Scare distance, often referred to in the scientific literature as “flight initiation distance,” is the distance at which birds are disturbed by a threat to their safety. The threat to the spoonbill typically is natural or domestic predators. The birds are most often threatened by the presence of people or dogs, movement, the flight of other birds, and sometimes sudden noise. Any such disturbance threatens their security and causes stress. The stress is most obviously indicated by flight from the threat.

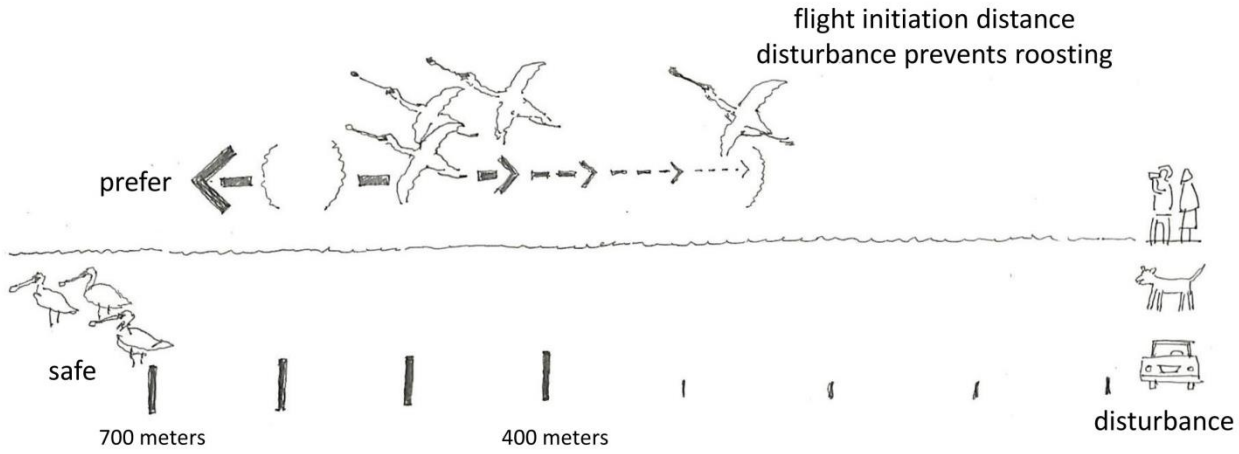
Stress may also prevent roosting or foraging; continuous stress leads to ill health and, in extreme cases, premature death and local extinction. When resting and roosting, often during the day, Black-faced Spoonbills are especially vulnerable to threats. The roosting scare distance at the prime habitat sites has been documented in Taiwan to be rarely less than 400 meters and in some cases as much as 700 meters.

Having adequate distance from threat is the most critical spatial consideration in determining if habitat is adequate and therefore valuable for the spoonbill. When this metric is applied to Jiading Wetland, and the proposal to build Road 1-4 through the wetland, at least two prime roosting sites will be impacted and likely rendered unsuitable for the spoonbill.

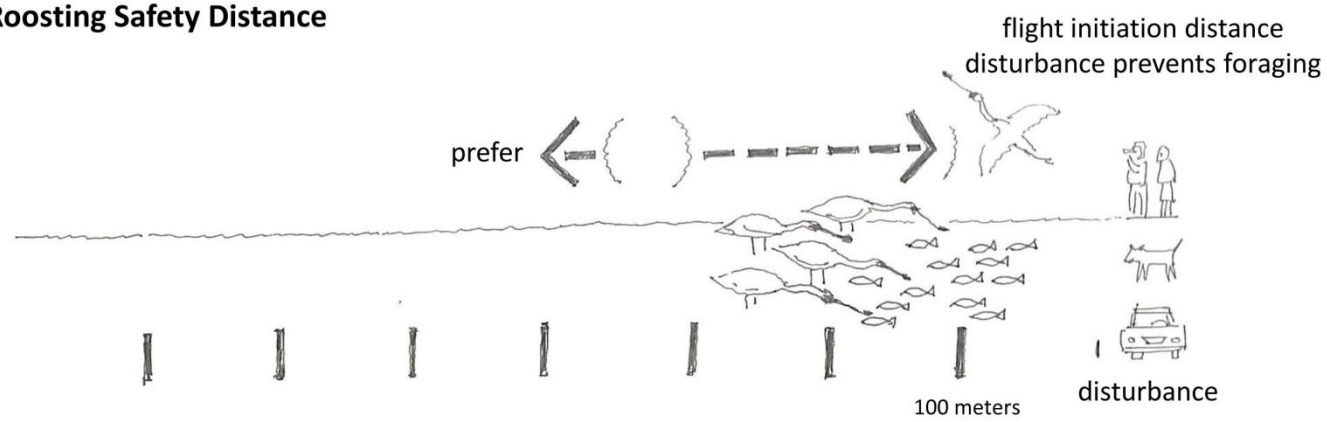
Black-faced Spoonbills appear to be less sensitive to the presence of people, dogs, and other disturbances when foraging, especially if there is an abundance of preferred prey available temporarily at a location, as in the case with fish ponds when the water is drawn down for harvest, or when waters in tidal or salt flats are less than 20 cm deep. People can sometimes be present within 100 meters when the spoonbills are foraging in those conditions. Whether the birds are severely stressed and tolerate the stress when food supply is limited elsewhere is not well documented.

A second factor, which is of concern at Jiading Wetland, is habitat fragmentation. The sites in Taiwan where the Black-faced Spoonbill congregate in large numbers for roosting and foraging consist of expanses of abandoned salt pans or other natural or modified flats, in prime habitat areas of 200-300 hectares of contiguous, undisturbed habitat. Jiading Wetland is slightly smaller but comparable in size to the sites Sihcao, Chigu, and Budai wetlands. Even in these sites roads and urban development delimit the habitat, fragmenting some areas into pieces too small to be used by birds. This fragmentation creates “island effects” which causes birds to go extinct if the areas are too small. This may happen in the B1 and B2 areas of Jiading Wetlands if Road 1-4 is built as proposed.

The recently built Roads 1-1 and 1-6 have divided the Jiading Wetland into smaller pieces and diminished its value as habitat. But the northern and southern halves of the wetland are still large enough to attract birds. The combination of island effects due to habitat loss and the loss of prime roosting sites due to intrusion into the scare distance cannot be mitigated with presently known techniques such as screening, berming, and buffering. The loss of prime roosting sites and further fragmentation of Jiading Wetland poses a serious threat to the Black-faced Spoonbill. To achieve a sustainable population of spoonbills, the wintering habitat must be expanded as the population of spoonbills grows. The loss of any part of Jiading Wetland threatens the long-term survival of the bird.



Roosting Safety Distance



Foraging Safety Distance

Having adequate distance from threat is the most critical spatial consideration in determining if habitat is adequate and therefore valuable for the spoonbill. When this metric is applied to Jiading Wetland, and the proposal to build Road 1-4 through the wetland, at least two prime roosting sites will be impacted and likely rendered unsuitable for the spoonbill.

Flight Initiation Distance

Loss of habitat from fragmentation is a major cause of bird extinctions. This may happen in the B1 and B2 areas of Jiading Wetlands if Road 1-4 is built as proposed. The recently built Roads 1-1 and 1-6 have divided the Jiading Wetland into smaller pieces and diminished its value as habitat. But the northern and southern halves of the wetland are still large enough to attract birds. The above map shows areas presently used by the Black-faced Spoonbill.

Threat of Island Effects

黑面琵鷺棲息地的空間尺度

有關黑面琵鷺棲息地之空間需求在研究文獻中已有詳細的記載。其中與茄萣濕地和 1-4 號道路高度相關的包括以下兩項：警戒距離與度冬棲地之破碎化。

黑面琵鷺需求的警戒距離較其他鳥類大，特別是在黑面琵鷺棲息(roosting)時。警戒距離在科學文獻中通常被稱為飛行起始距離，指的是鳥類感受到威脅的距離。對於黑面琵鷺而言，主要的威脅來自於野生或馴養的肉食性天敵。黑面琵鷺通常會因為人或狗的存在、震動、其他鳥類的飛行、甚至是突然的噪音而感覺危險。此類干擾將威脅黑面琵鷺的安全並導致其感受壓力。最明顯的壓力反應現象就是黑面琵鷺會為了自身安全而突然飛起。

壓力甚至會使黑面琵鷺無法進行棲息或覓食。長此以往，黑面琵鷺的健康也將受到影響，甚至導致過早死亡，乃至地區性的大量死亡。黑面琵鷺通常會在白天棲息，這也是其最容易受到威脅影響的時間。在台灣主要的黑面琵鷺棲息地中，警戒距離幾乎均大於 400 米，甚至在有些情況下會達到 700 米。

充足的警戒距離是判別一地是否適合黑面琵鷺棲息最重要的空間條件，對於黑面琵鷺而言其意義也最為重大。在此標準下，若 1-4 號道路穿過茄萣濕地，則至少有兩個既有的棲息(roosting)點將受到道路的影響，並極有可能無法再提供黑面琵鷺作為棲息地。

當黑面琵鷺覓食時，其對於人、狗或其他干擾則顯得較不敏感，特別是當覓食地點存在豐富的食物時。例如，當魚塭為方便捕撈而將水抽乾時，或是當灘地和廢棄鹽田的水深小於 20 公分時，這些地點將成為黑面琵鷺理想的覓食地點。在此情況下，人類有時可以在 100 米的距離內接近黑面琵鷺。鮮有記錄指出黑面琵鷺是否會在食物有限的地點感到過度緊張。

第二項關於茄萣濕地受道路開發之影響為棲地破碎化的疑慮。在台灣，吸引大量黑面琵鷺聚集棲息和覓食的棲地是以廢棄鹽田或是人工及天然的灘地為主。同時，主要的棲地面積多達到 200-300 公頃，土地範圍連續且不受外界干擾。茄萣濕地面積稍小，但與四草、七股、布袋濕地面積相當。然而，在四草等濕地中，道路和城市開發已經將濕地割裂。某些被割裂的濕地由於面積過小而無法為鳥類利用。棲地的破碎化將產生生態孤島效應，當某些孤島面積過小時，棲息其中的鳥類將有可能滅絕。如果 1-4 號道路按原計畫建設，則此問題將可能在茄萣濕地中的 B1 和 B2 區域發生。

近期興建完成的 1-1 號道路和 1-6 道路已將茄萣濕地劃分成數個較小的區域，降低了茄萣濕地的生態價值。然而濕地的南北兩側仍然分別擁有有足夠的面積吸引鳥類利用。棲地面積的損失，以及在警戒距離範圍內的工程建設將導致孤島效應，而現有已知的防護措施，如人工屏障和緩衝區等，並不能有效緩解孤島效應。茄萣濕地棲地的消失及進一步的破碎化將對黑面琵鷺的生存帶來嚴峻的挑戰。為了使黑面琵鷺的族群得以延續，度冬棲地的面積也有必要隨黑面琵鷺族群數量的增加而擴張。茄萣濕地對於黑面琵鷺族群的長期生存發展有著不可或缺的重要作用。

Wetland Ecology

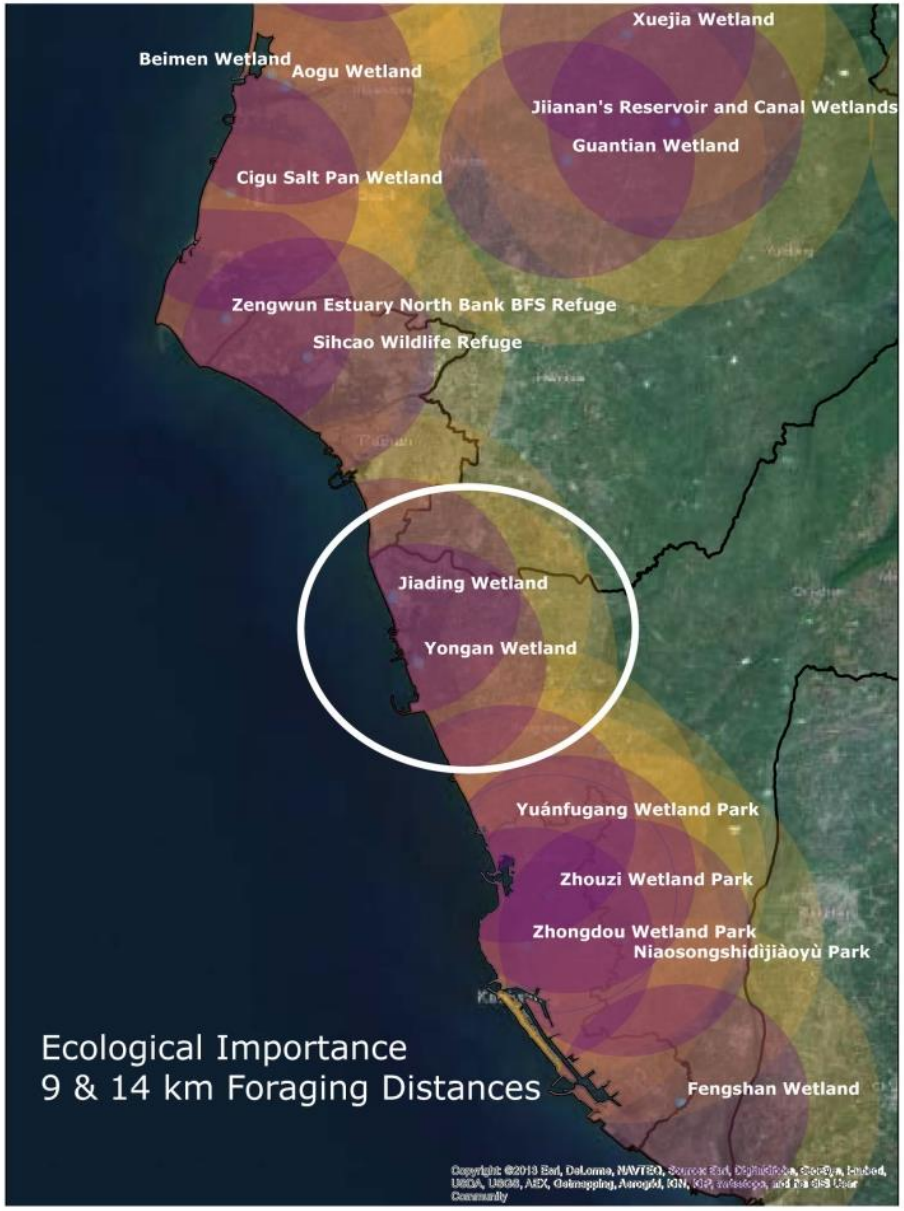
Different reports and official websites state that Jiading Wetland currently supports between 120 and 150 different species of birds throughout the year including:

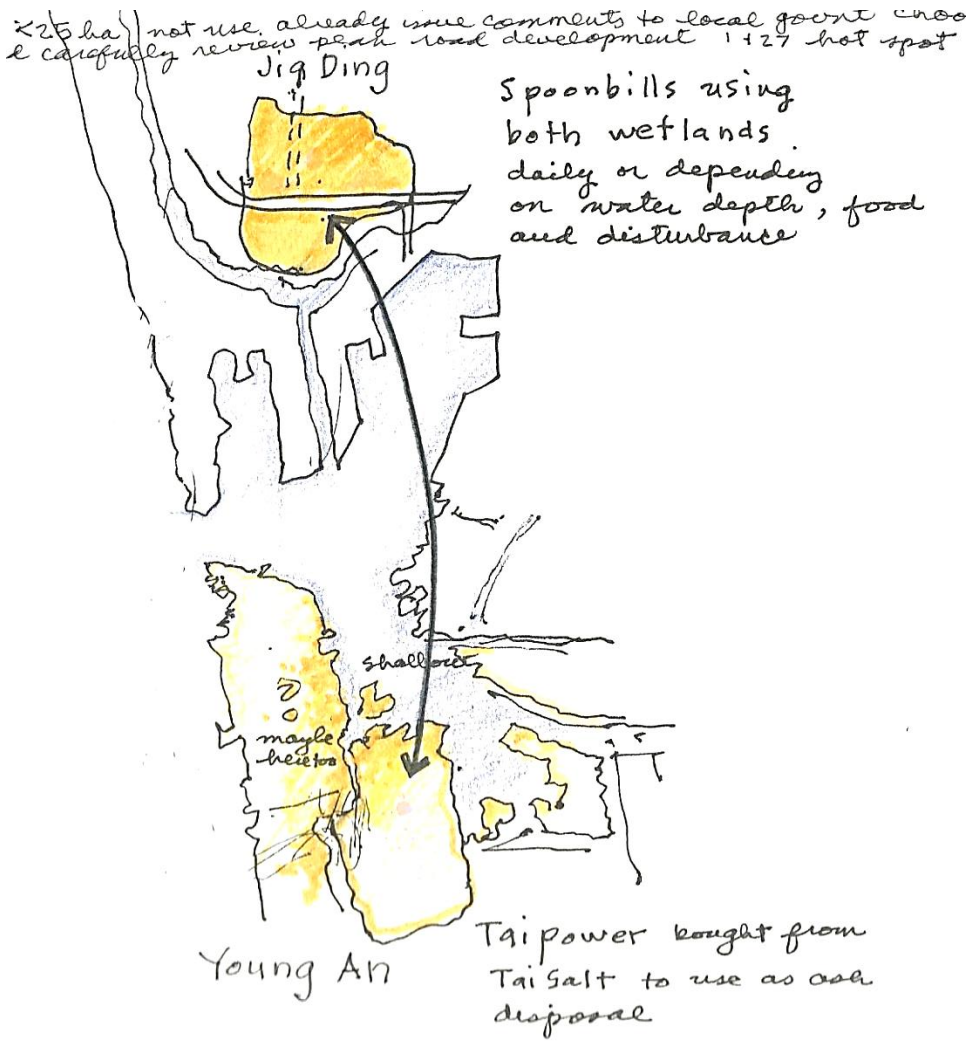
- Endangered species: Black-faced Spoonbill, Oriental White Stork, Peregrine Falcon
- Rare and valuable species: Little Tern, Chinese Egret, Grey Frog Hawk, Grey-faced Buzzard-Eagle, Osprey, Besra Sparrow Hawk, Crested Serpent Eagle
- Other species needing protection and conservation: Brown Shrike, Eastern Collared Pratincole
- An unusually large population of Kentish Plovers (3,000 have been recorded)

The Black-faced Spoonbill is a globally endangered bird and one of Taiwan's national treasures. Jiading Wetland is now a major habitat for Black-faced Spoonbills – over 90% of Kaohsiung County's spoonbill population winters in the wetland. The numbers have grown quickly in the past few years: peak counts have been 2011: 43, 2012: 56, 2013: 154, 2014: 189 (February peak; the official International Black-faced Spoonbill Census recorded 157).

The Black-faced Spoonbill will typically forage 9-14 km from a roosting site. It is known that the birds move regularly between the Jiading and Yong-an Wetlands. Both of these wetlands act as a single unit because birds will travel between the two sites to forage, roost, or flee from disturbance (verified by field research in 2014).

Additionally, the two wetlands create connective core habitat, or a central bridge between roosting and foraging areas north and south. They link to the north: Sihcao wetland – 21 km away and to the south: Yuanfugang wetland -21 km away. This core is an integral component in creating a cohesive ecological corridor along the western coast of Taiwan. If either of the wetlands is significantly altered, the habitat value may be decreased, thus separating the northern and southern wetland regions. If they become undesirable or inhospitable for species, the function of the larger corridor could be put in jeopardy.





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Jiading and Yong-an Wetlands as One Ecological System

分析：濕地生態

不同的報告和官方網路資訊指出，目前茄萣濕地內全年統計有 120 至 150 種不同的鳥類出現。其中包括：

瀕危物種：黑面琵鷺、東方白鸛、遊隼。

珍稀物種：小燕鷗、唐白鷺、赤腹鷹、灰面鵟鷹、魚鷹、松雀鷹、大冠鷲。

應予保育物種：紅尾伯勞、燕鴴。

數量眾多的東方環頸鴴 （記錄數量超過 3000 隻）

黑面琵鷺不僅是國際級的瀕危物種，也是台灣的珍寶。茄萣濕地目前已屬全球黑面琵鷺的主要棲息地之一，高雄市內超過 90%的黑面琵鷺在茄萣濕地度冬。茄萣濕地中黑面琵鷺的數量在過去幾年中快速增加。2011 年的最大數量為 43 隻、2012 年的最大數量為 56 隻、2013 年的最大數量為 154 隻、2014 年的最大數量為 189 隻（該年，全球黑面琵鷺同步普查的官方數字為 157 隻）。

黑面琵鷺通常會在距其棲息地 9-14 公里的半徑範圍內覓食。現已知黑面琵鷺會在茄萣濕地和永安濕地之間頻繁來往，在兩個濕地中覓食及棲息，並在受到干擾時從一個濕地飛往另一個濕地。因此，這兩個濕地均是黑面琵鷺生存的重要棲地。此一觀點已在 2014 年的田野調查中得到確認。

除此以外，這兩個濕地也是整體棲地網絡中的重要節點，扮演着連接南北棲地的重要角色。其連接了以北 21 公里外的四草濕地和以南 21 公里外的援中港濕地。茄萣濕地（及永安濕地）是台灣西海岸生態廊道中緊密而不可或缺的一環。如果茄萣濕地和永安濕地任一環境發生明顯的改變，則大尺度濕地的生態價值將大打折扣，並使其串連南邊和北邊的濕地斷裂開來。如果這些濕地無法吸引各類物種，那麼更大尺度上的生態廊道功能也將受到損害。

Wetland Classification and Law

According to Taiwan's Construction and Planning Agency, 82 wetlands have been recognized as important "according to Ramsar standards". Twelve of these wetlands are in Kaohsiung County including Jiading and Yong-an Wetlands.

Kaohsiung Wetlands of National Importance	
Jhouzai	9.1 ha
Nanzihsiian River	274.22 ha
Daguei Lake	19.1 ha
Kaohsiung Wetlands of Regional Importance	
Yong-an Salt Pan	131 ha
Jiading	171 ha
National Kaohsiung University	5 ha
Yuanjhong Harbor	29.41 ha
Banping Lake	12 ha
Niaosong	4 ha
Dashu Manmade (Old Railroad Bridge)	177 ha
Fongshan Reservoir	118 ha
Linyuan Manmade	50 ha

Both Jiading and Yong-an are designated Wetlands of Regional Importance. These designations were made six years prior to passage of the Wetland Conservation Act, and prior to the significant numbers of Black-faced Spoonbills now using the wetlands. As discussed elsewhere in this report, Jiading Wetland is the winter home to 5.5% of the global population and 9.5% of Taiwan's population of the endangered Black-faced Spoonbill. The biodiversity and ecological function that this site currently displays is evidence to support the reclassification of the wetland from local importance to national or international importance under the International Ramsar Convention on Wetlands, which states that any site supporting more than 1% of the population of an endangered species is considered a "wetland of international importance".

Jiading and Yong-an Wetlands should be reclassified as a wetland of national importance, at a minimum which would give the wetland more protection under the newly passed but Wetland Conservation Act. A careful evaluation of the Jiading and Yong-an Wetlands might conclude that they qualify to become additions to the Tiajiang National Park and/or Southwest Coast National Scenic Area.

The focus of this report is on the Jiading Wetland because of the current politics and timing of proposed Road 1-4. The Wetland Conservation Act was passed last fall but is not yet in force. And when the Road 1-4 EIA will receive its final review is unclear. Once the Wetlands Conservation Act takes effect, its stipulations that are stricter will have higher authority than other laws, for example those governing the EIA process as well as local urban plans. As stated in Article 2 of the Wetland Conservation Act, "Relevant matters concerning the planning, conservation, restoration, utilization operation and management of wetland shall be in accordance with the stipulations set by the law. If there are stricter stipulations by other laws, such stipulations are to be followed". More to the point, the act would prohibit Road 1-4 from being built through Jiading Wetland if it were reclassified. As stated in Article 16, "Wetlands of International and National Importance, except under special circumstances as described in subparagraph III to subparagraph V in the preceding paragraph, may not be developed or built."

There are several key administrative tasks that would need to be taken for Jiading Wetland to achieve further protection. It could be formally reclassified prior to the final EIA review for Road 1-4. The wetland would need a Conservation and Utilization Plan to ensure wise use of the resource.

Again, the timing is tricky, but the intentions seem clear. A March 2014 press release issued by Kaohsiung City's Construction Office states, "Wetland is important, but we can't give up everything just for conservation". Yet realizing that wetlands are essential for a sustainable economy, Kaohsiung City pursued the spirit of the Ramsar Convention by creating 900 hectares of wetlands over the past decade. For Jiading Wetland not to be given the highest wetland classification possible is policy doublespeak. Despite not being a member of the Ramsar Convention at this time, Taiwan, in its recent wetlands conservation efforts, has relied on Ramsar principles and criteria to guide its work. Taiwan's Wetland Conservation Act in no small way is informed by Ramsar. In its own documents, Kaohsiung City's Wetland Ecological Corridor was planned "in accordance with the spirit of the Ramsar Convention". Conservation must preside.

分析：濕地分類及相關法規

台灣內政部營建署參考《拉姆薩國際濕地公約》之標準，指定了 82 處重要濕地。在高雄市範圍內，共有 12 個重要濕地，其中包括茄萣濕地和永安濕地。

國家級重要濕地	
洲仔濕地	9.1 公頃
楠梓仙溪濕地	274.22 公頃
大鬼湖濕地	19.1 公頃
地方級重要濕地	
永安濕地	131 公頃
茄萣濕地	171 公頃
高雄大學濕地	5 公頃
援中港濕地	29.41 公頃
半屏湖濕地	12 公頃
鳥松濕地	4 公頃
大樹人工濕地	177 公頃
鳳山水庫濕地	118 公頃
林園人工濕地	50 公頃
其他濕地（未列入以上體系）	
林園海洋濕地公園	6.2 公頃
檨仔埤濕地公園	3.75 公頃
高雄美術館(內惟埤)濕地	3 公頃
愛河	7,415 平方公尺
中都濕地公園	12.6 公頃
本和里滯洪池濕地	2.43 公頃
鹽水港濕地	4 公頃

茄萣濕地和永安濕地同屬於地方級重要濕地。此一分級在《濕地保育法》通過前六年即已劃設。當時，黑面琵鷺尚未大量出現在以上兩個濕地中。正如本報告前文所述，茄萣濕地是全球 5.5%、全台 9.5%的黑面琵鷺度冬場所。而此濕地所展現之物種多樣性和生態功能足使茄萣濕地由地方級升級為國家級重要濕地。提升劃設層級的重要依據正是《拉姆薩國際濕地公約》，因其指出棲息有超過某一瀕危物種族群數量 1%的棲息地即應當被認定為國際重要濕地。而目前茄萣濕地正符合此標準。

茄萣濕地和永安濕地應被劃設為國家級重要濕地。在此基礎上，新通過的《濕地保育法》應針對以上兩個濕地予以更全面的保育。透過對以上兩個濕地的詳細分析可得出，茄萣濕地和永安濕地或應可納入台江國家公園或是雲嘉南濱海國家風景區管轄。

考量目前高雄市政府計畫建設 1-4 號道路的政治情勢與時間點，本報告乃聚焦於茄萣濕地。《濕地保育法》在 2013 年通過，但尚未施行，而對於 1-4 號道路進行最終決策的時間也尚未確定。《濕地保育法》第二條規定：“濕地之

規劃、保育、復育、利用、經營管理相關事務，依本法之規定；其他法律有較嚴格之規定者，從其規定。”因此，一旦《濕地保育法》開始實施，其法律效力將高於其他法規，例如目前的環境影響評估和地方的都市計畫皆應依法調整之。又《濕地保育法》第十六條規定：“國際級、國家級重要濕地，除前項第三款至第五款之情形外，不得開發或建築”。因此，若茄萣濕地之分級得以提升，則 1-4 號道路將無法穿過茄萣濕地。

要進一步保育茄萣濕地還需要配套許多重要的行政措施。例如在 1-4 號道路環境影響評估執行前即將茄萣濕地重新指定為更高層級的濕地。茄萣濕地也亟需保育及利用計畫，以確保相關資源之明智利用。

於此再次強調，對於茄萣濕地的保育而言，目前的時機是關鍵的，目標是明確的。2014 年 3 月，高雄市政府工務局針對茄萣 1-4 號道路開闢工程所發布之新聞稿指出，“溼地很重要，但不是為了生態保育，什麼東西都不能碰。”在過去十年中，高雄市政府因體認濕地對於永續發展的重要性，秉承《拉姆薩國際濕地公約》的精神，已建設、復育了 900 公頃的濕地。依此邏輯，若不將茄萣濕地劃設為較高層級的濕地，則無疑是一種自相矛盾的作為。儘管目前台灣尚未加入《拉姆薩國際濕地公約》，但台灣已經按照該公約的準則和精神展開了一系列的保育工作。而《濕地保育法》在很大的程度上也受到拉姆薩公約的影響。在高雄市的官方文件中，高雄市濕地生態廊道更是按照《拉姆薩國際濕地公約》的精神進行規劃的。綜上所述，環境保育應優先於包括經濟發展在內的各項事務。

Literature Review

In order to evaluate the EIA for Road 1-4, the SAVE-UC Berkeley research team conducted background research on potential negative economic and environmental impacts of constructing the road, verified site conditions through field study, and researched analogous case studies. These methods provided evidence of potential impacts and revealed issues requiring further study.

Effects during construction	Factors most critical at Jiading Wetland
Direct loss of habitat and biota.	X
Effects resulting from infrastructure and supporting activities for construction.	X
Impacts may occur beyond immediate vicinity of road: for example changes in hydrology. Mining for road aggregate may take place in different area. It is important to agree on geographical boundary for impact assessment.	X
Short term effects (new road)	
New linear surface creates new microclimate and change in other physical conditions extends varying distance from the road edge.	X
Newly created edge creates habitat for edge species.	X
Plant mortality increases along edge: and such mortalities may extend from road edge for varying distances.	X
Mortality of plants has direct and secondary effect on other organisms.	X
Some fauna will move from area of road as result of habitat loss and physical disturbance.	X
Animals are killed by traffic.	
Long term effects	
Animals continue to be killed by traffic.	
Road kills have secondary effects as carrion.	
Loss of habitat and change in habitat extends beyond edge of road.	X
Changes in biological communities may extend for varying distances from road edge.	X
There is fragmentation of habitat and this in turn has implications for habitat damage and loss, for dispersal and vagility of organisms, and for isolation of populations.	X
Edge habitat (or ecotone) and traffic on road may facilitate dispersal for some taxa, including pest species.	X
Dispersal of pest species via ecotones or traffic may have secondary effect biological communities.	X
Associated structures such as bridges and tunnels may provide habitats for some taxa.	
Run-off from road affects aquatic communities.	X
Emissions, liter, noise, and other physical disturbances may extend into roadside vegetation for varying distances and result in changes in species composition.	X

Road Impact Research

A review of the scientific literature on this issue indicates that the impacts of roads on the wetland and in particular birdlife are considerably. The table below summarizes the known effects during construction and after a road is built, both in the short and long term.

Roads and Wildlife Impacts Cases

To assess best practices used in environmental impact assessments where endangered species habitat is in proximity to a proposed road, the team researched several case studies that were comparable to the issues related to constructing Road 1-4 through the Jiading Wetland and the impact on the endangered Black-faced Spoonbill. These case studies exposed the shortcomings of the EIA for the road, specifically serious omissions in the document and important questions that have yet to be answered.

San Antonio, Texas; U.S.A.: The Bracken Bat Cave meshweaver (*Cicurina venii*) was found during construction of a highway underpass project on Texas 151 at Loop 1604. Discovery of the spider halted the project in April 2012, which had been previously approved by the U.S. Fish and Wildlife Service and Federal Highway Administration. Road construction is expected to be permanently stopped because the area is thought to be full of underground caves that likely support the endangered spider and other species. Even though nearly 80,000 vehicles use the highway daily, the threat to the spider and the ecosystem were reason enough to halt construction. Road 1-4 would not serve nearly as many motorists as the San Antonio case. However it threatens an endangered species, the Black-faced Spoonbill, which only in the last few years have started to use the Jiading Wetland in substantial numbers. **Best practices require that in an EIA review the possibility of a negative impact on an endangered species should prevent even major highways from construction. Best practices also require that an EIA thought to be adequate at one time can later be ruled as insufficient at a later date, and in such a case, the project as a whole may need to be reconsidered or stopped altogether.**

Charlotte, North Carolina, U.S.A.: In 2011 the U.S. Fish and Wildlife Service stopped the construction of US 601, a $700 million highway project, believing the Environmental Impact Study's (EIS) declaration that water quality would be virtually unaffected was insufficiently researched. A Site Specific Water Quality Management Plan for the Goose Creek Watershed was required as were additional studies of new alternatives that could

minimize impacts on the watershed in order to save the Carolina heelsplitter (*Lasmigona decorata*), a freshwater mussel.

Similar to the Jiading Wetland, US 601 would have both direct and indirect effects on the local ecosystem. Both Road 1-4 EIAs only analyze the direct impacts of the road on the wetland, not indirect impacts that could potentially harm the Black-faced Spoonbill and other bird populations. **Best practices require an analysis of direct and indirect impacts on an endangered species which has not been done for Road 1-4.**

Salt Lake City, Utah; U.S.A.: In its comments on the Draft Environmental Impact Statement (DEIS) for the West Davis Corridor Freeway, the northern extension of the Legacy Parkway in Utah, the U.S. Department of Interior's (DOI) questioned whether or not the DEIS assessed enough alternatives. Both road scenarios evaluated would cut through the same corridor which is used by migratory birds, some endangered and threatened species. DOI believed that alternatives existed that would spare the Great Salt Lake's critical ecosystems. **Best practices require choosing a project alternative that avoids the habitat of the endangered species if such an alternative exists.**

Bolivia: A conflict began in 2011 over the proposal for a highway, part of which would cut through Bolivia's Isiboro Sécure National Park and Indigenous Territory (TIPNIS). While possibly improving Bolivia's poor highway infrastructure, opposition to the highway contended it could contaminate rivers needed for local fishing industries and open rainforest lands to illegal logging and settlements. The primary beneficiaries appear to be soy farmers and petrochemical companies who want access to the rainforest.

The area in question is home to 11 endangered species. In 2012 President Evo Morales intervened and put the project on hold. Similar to Road 1-4 there is local support for the project. However in this case, the extreme ecological importance of the habitat for endangered species is a higher priority than local government support, so national intervention was justified. **When an endangered species is at risk in a locally-supported project, best practices depend upon central government intervention to protect the endangered species.**

Des Moines, Iowa; U.S.A.: After the discovery of the endangered Indiana bat (*Myotis sodalis*) near a proposed I-80 interchange, construction was delayed to determine if the bats' habitat could be relocated. **The Kaohsiung government could face similar costly delays due to legal action based on the presence of the Black-faced Spoonbill if it were to move forward with plans to construct Road 1-4 through the Jiading Wetland.**

文獻及案例回顧

為檢討 1-4 號道路環境影響說明書，本研究團隊針對道路開發可能為茄萣帶來經濟發展和環境上之負面影響進行了背景研究，此乃透過實際田野調查了解基地現況，並分析相關案例來進行。由此，研究團隊找出開闢道路所具潛在影響之證據，並釐清需要進一步深入研究的問題。

道路衝擊分析

回顧科學文獻得知，道路對於濕地，特別是鳥類的影響是相當顯著的。以下表格內容為摘要已知在道路建設過程中及完工後對濕地和鳥類短期和長期的影響。

道路建設過程中的影響	茄萣濕地將面臨之關鍵影響
棲息地和族群的直接損失	X
營建工程中所需的基礎設施及相關活動的影響。	X
距道路一定範圍內的影響，例如水文方面的改變。在建設道路的工程中，將會在不同區域進行開挖，因此環境影響評估工作所界定之地理邊界劃定十分重要。	X
道路開闢之短期影響	
新建道路後，將會在距離道路中線一定範圍內產生新的微氣候，並改變某些其他自然環境條件。	X
透過形成新的地理邊界而為邊緣物種(edge species)提供新的生存空間。	X
植物的死亡率將會沿著道路邊界增加，並向道路兩側擴散。	X
植物的死亡將會對其他生物產生直接和間接的影響。	X
由於棲息地的喪失和自然環境的改變，某些動物將從道路周邊遷移出來。	X
往來的交通可能會造成動物的死亡。	
道路開闢之長期影響	
交通持續造成動物的死亡。	
交通導致動物死亡而產生次級效應，如增加腐敗的動物屍體。	
在道路兩側及周邊更大範圍內，發生棲息地減少和環境改變。	X
在道路兩側及周邊更大範圍內，生物群落往外延伸分佈。	X
棲息地破碎化並可能導致棲息地破壞和損失、物種的播遷與活動受阻、生物族群面臨孤島效應。	X
由道路造成的生態交錯區(ecotone)以及交通可能導致包括有害動植物、害蟲在內的族群傳播。	X
有害生物族群的傳播可能會對生物群落產生進一步的影響。	X
道路系統中的橋樑和隧道等可能會為某些物種提供新的棲息地。	
來自道路的地表徑流可能會對水生物產生影響。	X
交通廢氣排放、垃圾、噪音等其他影響可能會擴散到道路兩側不同距離範圍內而影響植物生存，並導致生物組成發生改變。	X

道路及其對生物影響的案例

一些同樣鄰近瀕危物種棲息地之道路開發環境影響評估案例為本研究提供許多值得引以為鑒的思考方向。研究團隊檢討了數個與 1-4 號道路情境相近的環境影響評估案例。這些案例分析結果指出 1-4 號道路的環境影響說明書存在不足之處，甚至有嚴重的疏漏，對一些重要關鍵的問題也未能提供說明。

美國德克薩斯州聖安東尼奧。在德克薩斯州 151 號公路 1604 環路一處高速公路地下通道建設的過程中，人們發現一種瀕危的蜘蛛(Cicurina venii)。因此一發現，原本已經由美國漁業與野生動物署、聯邦高速公路管理處核定的道路建設工程在 2012 年四月被中止。由於工程基地周邊地區的地底下遍布可供此種瀕危蜘蛛和其他物種生存的洞穴，此工程被認為應永久停工。即使每天有近 80,000 輛的車次在這條高速公路上行駛，但考量道路新建工程對於這種蜘蛛和其他物種的影響就足以使工程暫停。與此案例相比，1-4 號道路設定的車流量並不如德州 151 號公路繁忙，但是 1-4 號道路確實會影響黑面琵鷺的棲息。**德州經驗說明了，在環境影響評估中，為了避免對珍稀物種的負面影響，甚至可以禁止主要高速公路的建設；其同時說明了，先前被認為是合理的環境影響評估在已知生態條件改變後也有可能是不合理的。在此情況下，整個建設計畫應當被重新評估並暫停。**

美國北卡羅萊納州夏洛特。2011 年間，美國漁業和野生動物署阻止了一項投資金額達到 7 億美元的美國 601 號高速公路建設。其原因為美國漁業和野生動物署認定環境影響評估內容中關於水質不會受到道路建設影響的說明未經充分研究。為了保育 Carolina heelsplitter (Lasmigona decorata)這種淡水貝類，其要求擬定和實施一項針對大雁溪流域的水質管理計畫和額外的新替代性方案以降低道路工程對流域環境的衝擊。

類似於茄萣濕地的情況，601 號高速公路將會對當地的生態系統產生直接和間接的影響。然而，針對 1-4 號道路環境影響說明書僅分析了道路對濕地的直接影響，而沒有分析可能對黑面琵鷺和其他鳥類的潛在影響。**以本案例作為最佳實例說明，對於珍稀物種直接影響和間接影響的分析是必要的。然而這樣的分析在 1-4 號道路中卻未被執行。**

美國猶他州鹽湖城。在對於鹽湖城一條高速公路（West Davis Corridor Freeway, the northern extension of the Legacy Parkway in Utah）的環境影響評估檢討中，美國內政部(U.S. Department of the Interior)質疑此環境影響評估是否對替代方案作了充分的分析。因所有的道

路替代方案均穿越了同一條為遷徙鳥類和一些珍稀瀕危物種所使用的生態廊道。美國內政部認為實際上依然存在著可以保護大鹽湖生態系統的替代方案。**本案例說明，在條件允許的情況下，應該選擇可以避開珍稀動物棲息地的替代方案。**

玻利維亞。在 2011 年，一場圍繞著高速公路的爭論在玻利維亞展開。這條高速公路的一部分將會穿過玻利維亞的 Isiboro Sécure 國家公園和原住民領域。雖然建設這條高速公路可能改善玻利維亞原來較差的基礎設施環境，然而反對建設高速公路的團體表示該公路將會污染當地漁業賴以生存的河流，並使雨林蒙受非法伐木和不當居住開發的風險。而這條高速公路的主要受益人是那些希望進入雨林開發的大豆農人和石油化學公司。

玻ㄋ維亞的這片區域棲息著 11 種瀕危物種。在 2012 年，總統埃沃·莫拉萊斯(Evo Morales)干涉並暫停了這項公路建設工程。對照茄萣 1-4 號道路的情境，玻利維亞的這條高速公路也受到當地的支持。然而，這條高速公路所聯繫之極其重要的生態意義卻遠高於當地的支持。因此，國家對這條高速公路的建設採取了干預措施。**當瀕危物種由於地方意見而受到威脅時，最佳問題解決途徑往往是借助中央政府的力量進行干預，從而使瀕危物種得到保護。**

美國愛荷華州德梅因。在 I-80 州際高速公路上計畫建設的交流道基地發現瀕危的印第安納蝙蝠(Myotis sodalis)後，該交流道的建設工程便被延遲，主要是因考慮到蝙蝠的棲息地無法遷移。**如果高雄市政府堅持讓 1-4 號道路穿越茄萣濕地，那麼市政府將須面臨相關法律程序，整個工程也將像德梅因 I-80 公路交流道工程那樣被延遲。**

EIAs for Road 1-4

EIAs for Road 1-4 were conducted in 2013 and 2014 to examine the impacts of the proposed road against alternative routes. The first EIA analyzed Road 1-4 and three different "build" alternatives using the following criteria: transportation, function, safety, travel time, impact on wetland, related administrative process, and construction feasibility. Each alternative was scored using a single score, equal weighting scale from 1 to 5 to determine which alternative should be pursued. The 2014 EIA evaluated a fourth alternative. And the evaluation process was different. It used the same criteria for evaluation, with the exception of "related administrative process" which was replaced with "land and economic development". The evaluation and weighting process was changed – weights were assigned for each criterion ranging from 1 to 13, then a score between 1 and 5 was assigned based on each criterion for each alternative.

The scoring and analyses for both EIAs are summarized below.

1. Transportation Function, Safety, and Travel Time: Criteria include items such as length of road, travel time in seconds, and safety based on number of turns or curves in the road. Travel time estimates were slightly adjusted in the 2014 EIA. Zoning for Alternative #2 was given specificity, although this seems like it should have been addressed under the "Related Administrative Process/Land and Economic Development" criteria.

2013			
Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3
Proposed plan goes straight from south to north: 1. Relieve traffic pressure of Renai Road and Tai 17 Road 2. Safer to drive through 3. Shortest with 90 second travel time	Consistent with Master Plan. 1. Relieve traffic pressure of Renai Road and Tai 17 Road 2. Four 90-degree turns and some road sections are on the water, which is not safe 3. Travel time = 202 seconds	Consistent with Master Plan. 1. Relieves traffic pressure of Renai Road and Tai 17 Road 2. 90-degree turn at the intersection of Juguang Road and Alternative Plan #2, which is not safe 3. Requires special planning for the watch tower, travel may not be safe 4. Travel time = 179 seconds.	Mainly uses existing road and doesn't add new roads 1. No traffic pressure relief of Renai Road and Tai 17 2. Road, traffic is unsafe 90-degree turn at the intersection of Juguang Road and Neiwan Road, which is considered not safe. 3. Travel time = 174 seconds

2014				
Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3	Alternative Plan #4
Proposed plan goes straight from south to north: 1. Relieve traffic pressure of Renai Road and Tai 17 Road 2. Safer to drive through 3. Shortest with 90 second travel time	Consistent with Master Plan. 1. Relieve traffic pressure of Renai Road and Tai 17 Road 2. Four 90-degree turns and some road sections are on the water, which is not safe 3. Travel time = 150 seconds	Consistent with Master Plan. 1. Relieves traffic pressure of Renai Road and Tai 17 Road 2. Road has more curves, which is less safe 3. Road section near the gun tower needs special planning 4. Travel time = 159 seconds	Mainly uses existing road and doesn't add new roads. 1. No traffic pressure relief of Renai Road and Tai 17 2. Travel time = 174 seconds	Expansion of Neiwan Road and Qilou Road. 1. Partly relieves traffic pressure of Renai Road and Tai 17 Road 2. Two 90-degree turns 3. Travel time = 140 seconds

2. Impact on Wetland: Criteria analyze how much area the road would remove from the wetland and how this would affect vegetation and habitat. This portion of the analysis is nearly identical between the 2013 and 2014 EIAs.

2013			
Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3
1. Decrease the area of wetland by 14,205 m^2 2. Impact mangroves 3. Impact on the bird's habitat	1. Occupy 15,054 m2 of wetland 2. 934 meters road section will impact mangroves 3. 659 meters road section built on water, will seriously impacts the bird's habitat	1. Alternative Plan #3 will occupy 26,025 m2 of wetland 2. 308 meters road section will impact mangroves 3. Goes by the habitat of wild goose, duck, egret, etc., which will also have impact on it	1. Least impact on the wetland

2014				
Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3	Alternative Plan #4
1. Decrease the area of wetland by 52,196 m^2 2. 50 m road section will impact mangroves 3. Bigger impact on bird habitat	1. Decrease the area of wetland by 30,355 m^2 2. 934 m road section will impact mangroves 3. 659 m road section built on water, will seriously impacts the bird's habitat	1. Decrease the area of wetland by 47,547 m^2 2. 308 m road section will impact mangroves 3. Goes by habitat with more bird populations, will have more impacts on the birds	1. Doesn't go through or across the wetland, it has least impact on the wetland	1. Expansion of Qilou Road will decrease the wetland area by 1980 m^2 2. 267 m road section will impact mangroves 3. 267 m road section built above the water in the wetland

3. Related Administrative Process (2013)/Land and Economy Development (2014): This category changed between the 2013 and 2014 EIAs, but covers whether or not private land needs to be purchased or if planning or land use zoning needs to be changed. The 2014 EIA discusses how Road 1-4 would or would not stimulate development however it does not go into detail as to what the development benefits would be.

2013			
Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3
1. Same as city planning, no changes needed 2. EIA required for section goes through the wetland. 3. Land is public, so no private land needs to be purchased	1. Changes in city planning of Jiading District and Xingda Fish Port are required 2. EIA required for section going around wetland 3. Section 1-e of requires purchasing of private land	1. Changes in city planning of Jiading District and Xingda Fish Port are required 2. EIA required for section going around wetland 3. Land is public, no private land needs to be purchased	1. Uses existing roads, no city planning needs to be changed 2. Doesn't go through wetland, no EIA is required 3. Some private land needs to be purchased

2014				
Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3	Alternative Plan #4
1. Increase use of Juguang Road, help development along Juguang Road and Qilou neighborhood 2. Same as city planning, no changes needed 3. Land is public, so no private land needs to be purchased	1. Similar to proposed plan 2. Changes in city planning of Jiading District and Xingda Fish Port are required 3. Section 1-e of requires purchasing of private land	1. Helps development along Jugang road and east side of the wetland, road doesn't go through Qilou neighborhood, which is not helpful for development 2. Changes in city planning of Jiading District and Xingda Fish Port are required 3. Land is public, no private land needs to be purchased	1. Helps development along Neiwan road, uses existing roads, doesn't help the development along Juguang Road and Qilou Neighborhood 2. Uses existing roads, no city planning needs to be changed 3. Some private land needs to be purchased	1. Helps development along Neiwan road, south section is new and closer to Qilou neighborhood, so helpful for development of Qilou 2. Uses existing roads, no city planning needs to be changed 3. Some private land needs to be purchased

4. Construction Feasibility: In 2014 this criteria assessed project costs and level of construction difficulty. While both weighting systems yield very similar results, the 2014 EIA goes into more depth regarding anticipated construction difficulty. It also indicates that Alternative #1 would require a drainage solution, which was not mentioned in the 2013 EIA.

2013			
Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3
1. Construction cost: 100 million NT (3.3 million USD) 2. Construction time: 12 months 3. Construction difficulty: similar to ordinary road	1. Construction cost: 164 million NT (5.4 million USD) 2. Construction time: 15 months 3. Construction difficulty: more difficulty compared to ordinary road	1. Construction cost: 164 million NT (5.4 million USD) 2. Construction time: 14 months 3. Construction difficulty: similar to ordinary road.	1. Construction cost: 110 million NT (3.6 million USD) 2. Construction time: 12 months 3. Construction difficulty: more difficult compared to ordinary road, may need box culvert to prevent drainage problems

2014				
Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3	Alternative Plan #4
1. Construction cost: 100 million NT (3.3 million USD) 2. Construction time: 12 months 3. Construction difficulty: similar to ordinary road	1. Construction cost: 164 million NT (5.4 million USD) 2. Construction time: 15 months 3. Construction difficulty: goes through deep water, needs retaining wall and drainage	1. Construction cost: 164 million NT (5.4 million USD) 2. Construction time: 14 months 3. Construction difficulty: longer road, needs more land leveling	1. Construction cost: 110 million NT (3.6 million USD) 2. Construction time: 12 months 3. Construction difficulty: need culvert to prevent drainage problems in order to expand road	1. Construction cost: 150 million NT (3.6 million USD) 2. Construction time: 15 months 3. Construction difficulty: need culvert to prevent drainage problems in order to expand road

5. Scoring: In both the 2013 and 2014 EIAs, the Proposed Plan received the highest score, with Alternatives #2 and #3 ranked second in the 2013 EIA and Alternative #4 ranked second in 2014. It is important to point out that despite the Proposed Plan having the worst environmental impact it still received the best overall score in both EIAs. This seems impossible if best practices of environmental assessment were followed because under best practices the environmental impact would have been the highest weight.

It is also important to note that while a "no-build" alternative is discussed in both EIAs, it was never analyzed alongside the "build" alternatives. The extent of the "no build" discussion asserts that if Road 1-4 was not developed, existing roads would not be able to accommodate growth (local and visitor population combined), concentrating vehicular traffic on Renai Road. It would also reduce convenience for Qilou neighborhood residents who mainly rely on Qilou Road, which would be expected to worsen as tourism activity grew, and would limit the physical and economic development potential of Qilou. The SAVE-UC Berkeley research team was unable to find concrete evidence of these claims, and did find research that some of the claims were untrue. Qilou Village would most likely benefit considerably with additional tourism, particularly if visitor parking and other tourist facilities were strategically sited.

2013				
Category	Proposed Plan	Alternative Plan #1	Alternative Plan #2	Alternative Plan #3
Transportation Function, Safety, and Travel Time	5/5	3/5	1/5	1/5
Impact on Wetland	1/5	1/5	1/5	5/5
Related Administrative Process	3/5	1/5	3/5	3/5
Construction Cost and Difficulty	5/5	1/5	3/5	1/5
Total Score	*14*	*6*	*10*	*10*

2014										
Category	Proposed Plan		Alternative Plan #1		Alternative Plan #2		Alternative Plan #3		Alternative Plan #4	
	Original	Weighted	Original	Weighted	Original	Weighted	Original	Weighted	Original	Weighted
Transportation Function, Safety, and Travel Time	11.3	6.4	7.5	4.3	8.3	4.9	6.7	3.7	9	5
Impact on Wetland	7.4	5.1	9	6.7	9.2	6.9	13.4	9.8	12.5	9.2
Land and Economic Development	8.3	3	4.8	1.7	6	2.1	4.4	1.6	5.1	1.8
Construction Cost and Difficulty	8.4	2.1	5.4	1.4	7	1.8	5.4	1.2	5.6	1.2
Other	10.6	6.9	7.6	4.7	10.1	6.5	9.2	5.7	8.7	5.4
Total Score	*46.0*	*23.5*	*36.3*	*18.8*	*40.6*	*22.2*	*38.9*	*22.0*	*40.8*	*22.9*

In studying the evaluation of the alternatives considered in the EIA, the research team concluded that a 5th alternative should be considered. It utilizes public land that would be swapped with private land owners to create a more direct and safer route that also make the private land more valuable (see next page). Such alternatives would normally be part of a best practices EIA.

Even with a flawed weighting system, Alternative 1 does not score significantly better than other alternatives. If a proper weighting system, acceptable as best practices in international environmental assessment, is used, Alternative 1 scores the worst. “No build” scores best; Alternatives 3, 4, and 5 score much better than Alternative 1.

Alternative Locations for Road 1-4

分析：1-4 號道路環境影響說明書

本報告分析了 2013 年和 2014 年間兩個版本的環境影響說明書，兩份說明書皆分別檢討 1-4 號道路計畫和替代方案的影響。2013 年版本的環境影響說明書中對 1-4 號道路的規劃方案和三個不同的替代方案進行評估，並採用以下的標準進行評估：交通目的和功能（道路便利性、道路安全性、道路旅行時間）、對濕地的影響範圍、相關行政程序、工程施工情形。各個標準的權重相同，並按照 1-5 分的範圍給分，最終主方案和替代方案各得到一個評估分數，從而判斷應採用哪個方案。在 2014 年版的環境影響說明書中，新增加了一個替代方案。同時，替代方案的評估項目也有所改變。採用的評估標準幾乎相同，但“相關行政程序”被替換為“土地利用及經濟發展”。此項評估中還為每一個標準賦予權重，同時給分的分數範圍也改為 1-13 分。兩份環境影響說明書對方案評選的分析和給分總結如下：

1. 道路便利性、安全性和旅行時間： 其中具體的評估標準包括道路長度、以秒計算的通行時間、以轉彎數和道路線型曲線來度量的安全性。對於通行時間的估計在 2014 年的環境影響說明書中略有調整。同時，在此版本的評估中還特別就替代方案 2 分析了土地徵收的問題。然而此一問題似乎更適用於“土地利用及經濟發展”這一標準來評估。

2013 年			
主方案	**替代方案一**	**替代方案二**	**替代方案三**
北接莒光路，南與 1-1 號道路交接，整段路長約 947 公尺。	向西沿茄萣濕地邊界再銜接仁愛路一段，左轉崎漏路後，再銜接原 1-4 號道路。整段長度約 1,674 公尺。	向東沿茄萣濕地邊界銜接 1-6 號道路北端。整段長度約 1,735 公尺。	擴建內灣路長 485 公尺，其餘 723 公尺沿用原有仁愛路一段而不需興建。本段替代道路長度約 1,208 公尺。
1. 直線南北向，有助於抒解交通量大之仁愛路與台 17 線。 2. 直線與莒光路連接，交通安全性最佳。 3. 道路長度最短，旅行時間約為 90 秒。	1. 與主計畫南、北側銜接口一樣，對於道路路徑而言有助於抒解仁愛路與台 17 線交通。 2. 由莒光路沿茄萣濕地外繞行，總計需經 4 個直角轉彎，且部分道路建置於水面上，道路安全性最低。 3. 道路長度約為主方案 2 倍長，且因道路轉彎多而降低時速，旅行時間約為 202 秒。	1. 與主計畫北側銜接口一樣，且為新設道路，有助於抒解部分仁愛路與台 17 線交通量。 2. 與莒光路交接路口需直角轉彎，且行經槍樓所屬路段尚須規劃迴避，道路安全性不佳。 3. 由於道路長度約為主方案 2 倍長，旅行時間約為 179 秒。	1. 沿用既有道路，並無銜接至預定路口，就現況而言難以抒解仁愛路與台 17 線交通量。 2. 由莒光路轉至內灣路為直角轉彎，且其終點沿仁愛路斜角與台 17 線交接，由於台 17 線交通頻繁，其銜接方式恐有造成交通意外之虞，交通安全性低。 3. 由於道路起點與終點均與主

			方案不同，若銜接主方案南端，旅行時間約為 174 秒。

2014 年					
各項目細項	**主方案**	**替代方案一**	**替代方案二**	**替代方案三**	**替代方案四**
	直線開闢有助於串連與建構完整道路系統並紓解仁愛路負荷。	沿濕地西側周邊施作，仍有助於抒解仁愛路與台 17 線交通量。	沿濕地東側施作，尚有助於抒解部分仁愛路與台 17 線交通量。	擴建內灣路並將車流導引至仁愛路，難以抒解仁愛路交通量。	擴建內灣及崎漏路，可抒解部分仁愛路交通。
抒解地區交通量及建立區域完善交通網	直線開闢有助於串連與建構完整道路系統並紓解仁愛路負荷。	沿濕地西側周邊施作，仍有助於抒解仁愛路與台 17 線交通量。	沿濕地東側施作，尚有助於抒解部分仁愛路與台 17 線交通量。	擴建內灣路並將車流導引至仁愛路，難以抒解仁愛路交通量。	擴建內灣及崎漏路，可抒解部分仁愛路交通。
計畫道路交通安全性	連接莒光路南段，直線打通南北向，道路路徑無轉折安全性高	需經 4 個直角轉彎，且部分道路建置於濕地水域上。	沿茄萣濕地東側繞行，道路轉折多。	行經文化古蹟鹽田槍樓，需設計迴避及減速等措施。	需經 2 個直角轉彎，其終點為仁愛路與台 17 線路口。
計畫道路目的及旅行時間	道路長度約 947 公尺	旅行時間最短，約 90 秒	道路長度約 1,674 公尺	旅行時間約為 150 秒	道路長度 1,762 公尺。

2. 對濕地的影響範圍：評估標準分析了道路對濕地的影響面積，以及道路對植被和棲息地的影響程度。這部分的分析在 2013 年和 2014 年的環境影響說明書中幾乎相同。

2013 年			
主方案	**替代方案一**	**替代方案二**	**替代方案三**
1.道路開闢減少濕地面積約 14,205 平方公尺。 2.道路開闢於莒光路橋樑路段，影響部分紅樹林範圍。 3.因行經濕地範圍，對於鳥類棲息有影響。	1.道路開闢佔用濕地面積約 15,054 平方公尺。 2.道路開闢影響紅樹林範圍約 934 公尺，佔方案一道路長約 56%。 3.道路施工有 659 公尺路段需進行鋼板樁打設及水上施工，嚴重影響濕地內水域鳥類活動情形。	1.道路開闢佔用濕地面積約 26,025 平方公尺。 2.道路開闢影響紅樹林範圍約 308 公尺長，約佔方案二道路長度 21.9%。 3.濕地東側為雁鴨與鷺鷥等鳥類棲息地點，道路開闢對鳥類棲息造成影響。	道路不行經濕地，對於濕地範圍影響最小。

2014 年					
各項目細項	**主方案**	**替代方案一**	**替代方案二**	**替代方案三**	**替代方案四**
影響濕地面積及破碎化問題	切割且減少濕地面積約 52,196 平方公尺。	減少濕地面積約 30,355 平方公尺。	減少濕地面積約 47,574 平方公尺。	道路不行經濕地，對於濕地範圍影響最小。	拓寬崎漏路減少濕地面積約 1,980 平方公尺。
道路對於紅樹林影響範圍	影響紅樹林範圍約 50 公尺。	影響紅樹林範圍約 934 公尺。	影響紅樹林範圍約 308 公尺。		影響紅樹林範圍約 267 公尺。
影響保育鳥類棲息情形	因切割濕地 947 公尺，對於鳥類棲息及活動影響大。	沿濕地西側施作影響較小。有 659 公尺路段需於濕地水域上施工，影響濕地重要鳥類棲地。	沿濕地東側施作，因鳥類棲息東側邊界數量繁多，因此工程施作仍有影響濕地生態之虞。		道路施工有 267 公尺需於濕地水域上施工。

3. 相關行政程序（2013 年）/土地利用及經濟發展（2014 年）：在 2013 年到 2014 年的環境影響說明書中此一評估標準有所變化，但都包含了對是否需要購買私人土地、都市計畫是否需要變更的考量。2014 年的環境影響說明書中還檢討了 1-4 號道路是否會對經濟發展產生刺激

作用，但尚未能詳細討論 1-4 號道路究竟會為當地的發展帶來何種益處。

2013 年			
主方案	**替代方案一**	**替代方案二**	**替代方案三**
屬都市計畫道路範圍，故無須辦理都市計畫變更。2.行經濕地範圍內而需辦理環評作業。3.土地屬於公有土地撥用，無須進行土地徵收。	1.須辦理茄萣都市計畫區及興達港漁業特定區計畫變更。2.行經濕地範圍內而需辦理環評作業。3.道路 1-e 段應進行土地徵收作業。	1.須辦理興達港漁業特定區計畫變更。2.行經濕地範圍內而需辦理環評作業。3.土地屬於公有土地撥用，無須進行土地徵收。	1.無須辦理都市計畫變更。2.不經濕地範圍，無須辦理環評作業。3.既有都市計畫道路，但須徵收部分私有地

2014 年					
各項目細項	**主方案**	**替代方案一**	**替代方案二**	**替代方案三**	**替代方案四**
促進地方經濟發展及增加土地利用價值	道路直線開闢，可增加苖光路用路情形，並可促進苖光路周邊以及既有之崎漏社區地方經濟發展及增加土地利用價值。	與主方案相似，有助於促進苖光路周邊地方經濟發展及增加土地利用價值。	有利於促進苖光路及濕地東側周邊地方經濟發展及土地利用價值。 路線不行經崎漏社區，無助於崎漏社區之經濟發展。	有利於內灣路區域之經濟發展及土地利用。 因均屬既有道路，無助於苖光路及崎漏社區之經濟發展。	有利於內灣路區域之經濟發展及土地利用。 道路南段為新開闢路線，鄰近於崎漏社區，因此有利於崎漏社區之土地利用及經濟發展。
土地徵收問題、都市計畫變更	已辦理都市計畫變更並通過。 全數土地屬於公有土地撥用，無涉及私人土地徵收。	需辦理茄萣都市計畫區及興達港漁業特定區都市計畫變更。 崎漏路段需辦理土地徵收作業。	需辦理都市計畫變更，但範圍屬於公有土地撥用，無須進行土地徵收。	既有都市計畫道路，但拓寬須徵收部分私有地。	既有都市計畫道路，但內灣路拓寬路段及新闢建路段須徵收部分私有地。

4. 工程施工情形：在 2014 年的環境影響說明書中，重點考察了工程經費及期程、施作工程難易度。雖然兩個版本在工程施作情形方面的評分基本一致，但是 2014 年版說明書中在工程難易度方面做了更加細緻的分析。其同時指出替代方案一需要進行排水作業，而 2013 年版的環境影響說明書中沒有指出此問題。

2013 年			
主方案	**替代方案一**	**替代方案二**	**替代方案三**
1.工程經費約 1 億元。2.施工作業與一般道路相同，難度最低，預計工期約 12 個月。3.施工僅進行路基與瀝青鋪設，施工工法簡單	1.工程經費約 1.64 億元，較主方案高出約 1.6 倍。2.沿濕地公園深水湖區施作，增加擋土及排水作業，預估工期 15 個月。3.需於水面上進行施工作業，需打設鋼板樁，施工工法困難。	1.工程經費約 1.64 億元，較主方案高出約 1.6 倍。2.沿濕地公園邊界施作，路徑長且整地作業較繁瑣，預估工期 14 個月。3.施工僅進行路基與瀝青鋪設，施工工法簡單。	1.工程經費約 1.1 億元。2.拓寬內灣路需改建為排水箱涵，增加擋土及排水作業，預估工期 12 個月，且設置箱涵後有造成排水困難之虞。3.需於區域排水進行道路擴建，施工工法困難。4.區域排水以箱涵覆蓋，有影響區域排水之虞。

2014 年					
各項目細項	**主方案**	**替代方案一**	**替代方案二**	**替代方案三**	**替代方案四**
工程經費及期程	工程經費約 1 億元，工期約 12 個月	工程經費約 1.64 億元，工期 15 個月。	工程經費約 1.62 億元，工期 14 個月。	工程經費約 1.1 億元，工期 12 個月。	工程經費約 1.5 億元，工期 15 個月。
施作工程難易度及區域排水影響	施工作業與一般道路相同，難度不高	沿濕地公園深水區施作，需增加擋土及排水作業。	沿濕地周界施作，路徑長且整地作業較繁瑣。	拓寬內灣路需改建為排水箱涵，需考慮區域排水問題。	施工方式部份以箱涵覆蓋現有排水道，以及水面進行道路拓寬。 拓寬內灣路需改建為排水箱涵，需考慮區域排水問題

5. 評分：在 2013 年和 2014 年的環境影響說明書中，原計畫方案均得到最高分。在 2013 年的環境影響說明書中，替代方案 2 和 3 得到了第二高的分數。在 2014 年的環境影響說明書中，替代方案 4 得到了第二高的分數。需指出的是，在兩個版本的環境影響說明書中，儘管主方案在”對濕地影響範圍”方面的得分最低，但是其總分仍然是最高的。然而，若參考前文中各案例分析之經驗，則此情況是不可能發生的，對生態環境產生影響的因子權重應該是最高的。

   同樣需要指出的是，雖然兩個版本的環境影響說明書中均提到了零方案（不建設道路）的情境，但是這些零方案卻未能像那些擬建設道路的方案受到同樣詳細的分析。關於零方案的討論主張如果不建設 1-4 號道路，那麼現有道路將無法承載未來的交通成長量，以及伴隨本地人口和遊客增加所帶來的車流量，即無法緩解仁愛路上的交通壓力。零方案同樣會降低崎漏社區居民出行的便利性。崎漏社區的居民目前主要依靠仁愛路進出，而仁愛路的交通狀況被認為會隨著旅遊業的發展而進一步惡化。零方案甚至會限制崎漏社區未來的發展。本研究團隊無法從說明書內容中為上述觀點找到有力的證據，卻發現其中的某些觀點並不準確。本研究則是認為崎漏社區很有可能會在日益增長的旅遊活動中受益，特別是當遊客的停車和其他遊憩設施之選址過程是透過策略性的規劃決策時。

2013 年				
	主方案	**替代方案一**	**替代方案二**	**替代方案三**
交通目的功能分析	5/5	3/5	1/5	1/5
對濕地影響範圍	1/5	1/5	1/5	5/5
相關行政程序	3/5	1/5	3/5	3/5
工程施工情形	5/5	1/5	3/5	1/5
評分合計	14	6	10	10

2014 年										
	主方案		**替代方案一**		**替代方案二**		**替代方案三**		**替代方案四**	
	加權前	加權後	加權前	加權後	加權前	加權後	加權前	加權後	加權前	加權後
交通目的及功能	11.3	6.4	7.5	4.3	8.3	4.9	6.7	3.7	9	5
溼地影響程度	7.4	5.1	9	6.7	9.2	6.9	13.4	9.8	12.5	9.2
土地利用及經濟發展	8.3	3.0	4.8	1.7	6	2.1	4.4	1.6	5.1	1.8

工程可行性	8.4	2.1	5.4	1.4	7	1.8	5.4	1.2	5.6	1.2
其他項目	10.6	6.9	7.6	4.7	10.1	6.5	9.2	5.7	8.7	5.4
評分合計	46.0	23.5	34.3	18.8	40.6	22.2	38.9	22	40.8	22.9

透過對各替代方案的研究，研究團隊認為還需要有第五個替代方案。此方案利用原本將置換給私人的公有土地，建設一條更加直接和安全的道路，並可使周邊的私人土地價值提升（見ㄴㄚΠ　ㄚ　ˋYG

EIA Adequacy

According to Taiwan's Environmental Protection Administration (EPA), the Environmental Impact Assessment (EIA) process in Taiwan seeks to identify potential environmental, social, and other consequences of a proposed development project before proceeding with construction. The EPA seeks to create a set of standard procedures or environmental management programs to be followed by all development companies.

For any proposed development with an expected environmental impact, an environmental impact statement (EIS) will be prepared during Phase I of the EIA process. If the project is still considered to pose an environmental threat, the EIA process will move into Phase II and the developer is expected to revise and create a more in-depth EIS. In the next phases, the EIS is screened by an EIA review committee and then is subject to public consultation.

The 2013 EIA reveals very little about how the "Impact on Wetland" criteria were determined or how it was measured. It appears in the 2014 EIA to be mostly from professional or anecdotal sources, determined differently from each of the experts consulted. This alone could be considered "standardless discretion" and cause for legal action. Further, even though the 2014 EIA answers some of these questions, it still ranks ecological impact as less important than the others. If the alternatives are evaluated using best practice criteria and weighted accordingly then the presently preferred alternative for the road would rank as the single worst alternative.

While the EIA for Road 1-4 has undergone revision, this project has remained under local review. This is inappropriate because the Jiading Wetland is currently acting as a connective core habitat along the west coast of Taiwan. The alteration of this wetland could create negative ecological impacts that could extend far beyond the site itself. Additionally protecting the Black-faced Spoonbill is an international priority; therefore, any project that could potentially disrupt this bird's habitat requirements must be highly scrutinized and held to the highest standards. At a minimum the EIA should take into account the criteria and standards of the Wetlands Conservation Act and Ramsar. Because of the considerable anticipated impacts on the Jiading Wetland, this project needs to be reviewed at a national level because its impacts could extend beyond the local scale.

Remaining Questions

1. The EIA still ranks the Importance to Impact to Wetland as less important than other factors. This is contrary to standard best practices of EIA procedure. Specifically the impacts on now known resting and roosting sites requires scientific evaluation. Why has this not been done?

2. The estimated traffic system, and thus the need for Road 1-4, has not been updated to reflect changing land use designations in areas close to Jiading Wetland. Further, an important road alternative was ignored altogether. Why has this inconsistency not been rectified? Who is the committee that will conduct the final review and make the decision? Will any new work be done on the EIA prior? Will the committee require updated traffic demands relative to land use intensity downsizing?

3. The 2014 EIA was conducted by 11 experts, each with over 16 years experience and across different backgrounds including developers and environmental engineers however no one on the committee was a wildlife expert which yielded a "no decision" outcome. As a result the 2014 EIA was passed on to the next committee for review. What are the methods behind the scoring? Is unscientific bias distorting the weighting system?

4. While briefly described, why is the "no-build" scenario not assessed under the same criteria as the proposed plan and alternatives? This is standard procedure in an EIA process.

5. The primary reason that the assessment of the impact of the proposed road is inadequate is because the Jiading Wetland is 'under-ranked'. Due to its significance as a core habitat and a connective stepping stone habitat for the endangered Black-faced Spoonbill, and the number of spoonbills now using the site for roosting and foraging, why has the wetland not been reclassified to at least national or international level?

6. There have been two revisions of the EIA for Road 1-4, the second largely because of the presence of a nationally endangered species, but this project has remained under local consideration. Why is this project not being reviewed at a national level given its impacts could extend beyond the local scale? If the Jiading Wetland is reclassified to a Wetland of National Importance, the ecological impacts would likely weigh more heavily.

環境影響評估的合理性

根據台灣行政院環境保護署的相關規定，環境影響評估應當在開發建設開始實施前對其可能造成的環境、社會等影響進行評估。行政院環境保護署希望環境影響評估為一系列標準流程，並由所有開發單位所遵行。

對於任何可能產生環境影響的開發建設，開發單位應在第一階段的環境影響評估中出具環境影響報告書。當開發行為被認定可能產生環境威脅時，環境影響評估應進入第二階段審查。此時開發單位應對環境影響報告書進行進一步的修正和問題釐清、替代方案提擬等。在第三階段中，環境影響評估將先經由環境影響評估審查委員會審查，其後對公眾進行說明。

針對茄萣區 1-4 號道路（莒光路南段）開闢工程環境影響說明書分析，2013 年版的說明書中並未清楚地指出“對濕地影響範圍”之評分準則是如何確定並進行評分的。在 2014 年版的說明書中，關於該標準的評分主要由受委託製作說明書之工程顧問公司所延聘之專業人士執行，不同專家對此標準之評價也不盡相同。這種標準不明的自由裁量將可能導致法律訴訟。此外，儘管 2014 年版說明書就“對濕地影響範圍”之評分項目已作出進一步的說明，該評價標準的權重相較於其他標準仍然偏低。就原方案和各替代方案而言，若按照前文中提及諸多道路開發環評案例採取**最佳實踐**之評價標準賦予權重並進行評分，則原方案所獲得之分數將是最低的。

雖然目前該說明書仍在進行修改中，但此一評估始終僅是從地方尺度的觀點來進行的。對於茄萣濕地如此重要的生態節點而言，僅從地方尺度來審視此一濕地是不合理的。茄萣濕地生態環境的改變不僅將對濕地本身產生影響，更會影響到與之相聯繫的其他濕地。除此以外，由於保護黑面琵鷺是一項國際使命，有關黑面琵鷺棲息地的開發建設均應按照最高標準進行檢討。相關環境影響評估至少應遵循《濕地保育法》和《拉姆薩國際濕地公約》（《特別是作為水鳥棲息地之國際重要濕地公約》）中的相關要求。考量 1-4 號道路的開闢將對茄萣濕地和周邊地區產生可觀的環境影響，此一開闢工程及其環境影響評估應該擴大至全國性的層面加以重新檢討。

仍然存在的問題

1. 環境影響說明書中依然認為“對濕地影響範圍”之評分標準的權重應低於其他項目。然而，這樣的作法卻是與**最佳實踐**準則相矛盾的。特別是 1-4 號道路將對茄萣濕地內鳥類棲息和覓食的場所造成影響，這些影響需要進行更為科學的評估。為何環境影響說明書中對這些內容未能有所體現？

2. 規劃中的路網體系以及對於 1-4 號道路的需求，實際上與茄萣濕地周邊的土地利用並不契合，也未能反映周邊土地利用已改變的事實。此外，其中一個重要的替代方案在評估中也完全忽視此現象。何以道路計畫與土地利用不一致的情形未能被修正？最終對環境影響評估作出決定的委員會是如何構成的？於前文分析過的兩個版本的環境影響說明書的基礎上，是否可以開展新的工作？考量濕地周邊土地開發強度下降的現實後，環評委員會是否會重新檢討交通的需求？
3. 2014 年寫成的環境影響說明書，其顧問團隊是由 11 位具有 16 年以上工作經驗、來自不同背景的開發商和環境工程師組成。然而，其中卻缺少了野生動物專家的身影。野生動物專家極有可能會倡導“零方案”。2014 年的環境影響說明書專案小組審查會議，也因為審查委員中缺少生態背景的專業者而被要求逕送環評大會審查。那麼，方案評分背後又會受到什麼力量主導？是否會因存在不科學的偏見而誤導了權重體系？
4. 儘管有簡單的表述，但為何“零方案”沒有像主方案和替代方案受到相同程度的評估？此本應為環境影響評估之的標準流程。
5. 對 1-4 道路的環境影響作出不合理評估的主要原因是茄萣濕地的實際重要層級低於其應有的層級。若考量茄萣濕地是瀕危物種黑面琵鷺棲息地中的重要節點，而且大量的黑面琵鷺在此濕地中棲息和覓食，為何茄萣濕地未被重新劃設為國家級或國際級重要濕地？
6. 目前存在不同版本的環境影響說明書，2014 年版本的出現主要是由於黑面琵鷺這種全球瀕危物種在茄萣濕地中出現。但是對於 1-4 號道路的環評檢討卻仍然侷限在地方尺度上進行。那麼，考慮到 1-4 號道路的影響範圍已經遠遠超出茄萣當地範圍，相應的環境影響評估為何沒有放在全國的尺度上來檢討？如果茄萣濕地被指定為國家級或國際級重要濕地，那麼環境影響方面的指標所佔的權重將應更大。

Strategies for a Sustainable Economy in Jiading

The most successful, sustainable economic development plans build on local resources so that local entrepreneurs capture financial benefits and residents find jobs locally, rather than pursuing outside industries that never materialize. The Jiading area is rich in exactly the resources needed to create such an economy.

Existing Conditions and Competitive Advantage

Yet Jiading's economic story is complex. Different than the population of Kaohsiung City and Tainan City (which have grown), the population of Jiading District decreased between 2003 and 2013 (5.9%). Prior to Typhoon Morakot in August 2009 over 50% of the labor force worked in fishing, the area's primary industry. The numbers have rebounded since 2009, but not to pre-typhoon levels. In 2006 11% of the population worked in wholesale and retail, 7% in agriculture. It is thought that a growing number of residents commute north to Tainan to work in manufacturing

The Xingda Harbor is one of the major fishing harbors in Kaohsiung City but over 100 hectares remain vacant or underused. Even though the area has numerous temples, the tomb of Ning Jin King, eco farms, markets, and festivals, Jiading's tourism industry is underperforming relative to other parts of the region and Taiwan. The Love Pier, built as a primary regional attraction, is considered a failure. Overnight accommodations are virtually non-existent in the area.

That said, Jiading is strategically located to grow as a weekend recreation destination for Kaohsiung and Tainan, Taiwan's second and fifth largest cities. It is an easy day trip or weekend getaway for people seeking nature and a change of scenery from the city – only an 18 minute drive to Tainan City and 42 minute drive to Kaohsiung City. It is a 25 minute drive from the Tainan High Speed Rail station. Passenger travel at this station has grown tremendously – up 149% between 2007 and 2012; 6,158,112 passengers in 2012. Of any site the Black-faced Spoonbill inhabits in significant numbers in Taiwan, Jiading Wetland Park is the place closest to the high speed train for visitors from around the region, the country, and the world to view these popular birds. Improvements have been made at the south end of the park, attracting visitors because its excellent design allows bird watchers to see spoonbills and other birds in much closer range than anywhere else in Taiwan.

Land use designation for Jiading Wetland has recently changed in a way that potentially could have a significant positive impact on the local economy. In the 2002 plan for Xingda Harbor, the portion of the wetland north of Road 1-1 was to become a residential neighborhood with schools and a sewage treatment plant. The part of the wetland south of the road was designated "port". In the December 2012 plan part of the wetland (both north and south of Road 1-1) was reclassified to a "park" designation. Further, key parcels adjacent to the harbor were reclassified for commercial or recreation-serving land uses.

These reclassifications could give the area a boost if implemented with a strong ecotourism vision. A local fishing fleet, fish farms, a fish market, seafood restaurants, and a harbor can already be found in Jiading and Taiwanese tourists enjoy fish-based activities. It is comparable to other fish-based communities such as Oyster Harbor, Mitou, and Budai. The under-used land in the harbor could be developed for world-class facilities. A visitor center, fish museum, and large-scale tourist "villas" are under consideration. The SAVE-UC Berkeley research team agrees that these types of uses may be appropriate if located properly. They conclude that it is essential to protect the wetland to the south of Road 1-1 from development and restore it to habitat, put a visitor center close by, move the tourist villas contemplated for the wetland south of Road 1-1 to another area at the harbor, and make room for research and value-added fish products facilities.

The recent designation of scenic routes for biking loops Jiading into a fast-growing sport in Taiwan. This system could be expanded to link local attractions. The nearby waters provide opportunities for environmental education, recreation, boat tours. The Tai Salt worker village in Yong-an, adjacent to the Yong-an Wetland Education Center, could be an attraction for education – from school children to those interested in architectural history and salt culture. Towns and villages nearby offer unique opportunities for visitors to learn about local culture; providing jobs for younger people who typically leave to find employment in the bigger cities. Jiading and Qilou are especially located to benefit from visitor facilities.

The Wetland, the Road, and Economic Opportunity

For Jiading to grow a healthy economy a solution must be found to the on-going debate over the proposal to build Road 1-4 through Jiading Wetland.

The solution must address multiple agendas to achieve long-term benefits for the whole area, not just a few property owners. The research team concludes that if Road 1-4 is rerouted outside the wetland or eliminated altogether, Jiading will continue to attract unprecedented diversity and numbers of wild birds, making it an international destination for birders, cultural, and ecotourists.

The Jiading District has many other natural and cultural resources that if utilized strategically, and integrated with the birding recreation already occurring at the Jiading Wetland Park, would improve the local economy and allow Kaohsiung officials to allocate money for infrastructure more wisely. At a March 2014 workshop, the research team worked with local people to map the resources that make them devoted to the Jiading area and that they thought visitors would enjoy. Using this information the UC Berkeley-SAVE research team worked with local allies – Citizens of the Earth, Taiwan; Jiading Ecology & Culture Association; Chinese Wild Bird Federation; Kaohsiung Wild Bird Society; and Wetlands Taiwan – to develop eight principles to inform a plan for a sustainable economy in Jiading:

1. Take advantage of Jiading's strategic location to make it a regional destination.
2. Grow the economy from the inside out to generate jobs for local people.
3. Utilize under-used and unrecognized resources.
4. Maintain and support local fishing, aquaculture, and agriculture to guarantee long-term food security and a sustainable economy.
5. Preserve unique natural resources for local benefit.
6. Develop facilities for cultural and ecological tourism in ways that benefit local people.
7. Provide diverse and authentic experiences for visitors based on the cultural traditions of Jiading.
8. Enable Jiading to thrive as global economies and climate change.

Building on these goals the team proposes a conservation and utilization plan that includes not only the wetland, but also its adjoining neighborhoods, old Jiading, Qilou Village, the new waterfront park, Yong-an Wetland, Xingda Harbor, and connections to the Tainan station of Taiwan High-Speed Rail. It also takes into consideration the critical and timely issues of regional transportation, demographic and Taiwanese tourism trends, and scientific predictions of sea-level rise.

茄萣永續經濟發展的策略

最為成功、永續的經濟發展模式通常是利用地方資源，使地方企業獲利、居民獲得就業機會，而非尋找那些可能永遠不會出現的外來企業。茄萣地區資源豐富，具備有實現成功而永續的經濟發展模式的條件。

現況條件和競爭優勢

茄萣經濟發展的歷史是複雜的。不同於高雄市和台南市市區日益增加的人口發展趨勢，茄萣區的人口正逐漸減少。2003 年-2013 之統計資料顯示，茄萣區的人口減少了 5.9%。在 2009 年 8 月莫拉克颱風襲擊台灣前，茄萣區超過 50%的勞動力從事漁業生產，漁業也是茄萣的主要產業。颱風過後，從事漁業的人口逐漸回升，但始終沒有達到莫拉克颱風前的數量。在 2006 年，11%的人口從事商品批發和零售業，7%的人口從事農業。同時，一般認為有越來越多的茄萣居民通勤至台南市從事製造業。

興達港是高雄市主要的漁業港口。然而興達港中仍有超過 100 公頃的土地閒置或未被妥善利用。同時，雖然茄萣區有數量眾多的廟宇、明寧靖王墓、生態農場、市場、節慶活動，茄萣的旅遊業相比於台灣其他地方而言，發展得並不良好。原本希望發展為區域內一大旅遊景點的情人碼頭也被認為是一個失敗的嘗試。情人碼頭周邊甚至沒有可以供遊客過夜的旅館。

茄萣可以作為高雄市（台灣第二大城市）和台南市（台灣第五大城市）民眾週末旅遊度假的目的地。由於茄萣區距離台南市區僅有 18 分鐘車程，而距離高雄市區也僅有 42 分鐘車程，茄萣也逐漸成為那些希望在週末追求自然、體驗不同地方風貌的城市人口的理想去處。茄萣區距離台南高鐵站只有 25 分鐘的車程。使用台南高鐵站的旅客數量顯著增加中，從 2007 年到 2012 年，旅客數量增長了 149%，2012 年旅客數量達到 6158,122 人次。在全台所有棲息大量黑面琵鷺的棲地中，茄萣濕地是唯一一個緊鄰高鐵站的。這也為周邊區域、全台、乃至全世界的遊客創造了絕佳的賞鳥條件。在茄萣濕地公園的南端已興建有一些遊憩設施，而這些設施因設計良好，使得賞鳥者可以在台灣前所未有的近距離內觀察黑面琵鷺和其他鳥類。因此，這些設施吸引了一定數量的遊客。

茄萣濕地的土地利用在近期內受到調整，將為茄萣地方的經濟發展提供更好的條件。在興達港 2002 年的都市計畫中，1-1 號道路以北的濕地部分被規劃為設有學校和污水處理廠的住宅區。而 1-1 號道路以南的濕地部分則被規劃為港口腹地的一部分。在 2012 年 12 月都市計畫變更後，1-1 號道路南北兩側的部分則都被變更為公園用地。此外，鄰近港口的幾個關鍵性區塊被指定為商業或休閒娛樂服務設施用地。

如果這種都市計畫的調整可以和生態旅遊相結合，那麼它們將會為茄萣區的發展帶來新的活力。茄萣已經具備了捕魚船隊、魚市場、海鮮餐館、漁港等設施，而台灣遊客又非常喜愛與漁業相關的旅遊活動。這些設施和條件也使得茄萣較其他以漁業為基礎的社區，如蚵寮、彌陀、布袋港等，更具競爭力。而興達港中那些沒有妥善利用的土地則

可以用來開發世界級的旅遊設施，如遊客中心、漁業博物館、大規模的渡假村等。研究團隊一致認為如果可以適當選址，那麼這些設施將可以合理地發揮其作用。研究團隊同時認為需要對 1-1 號道路南側的濕地部分進行保育。避免在此部分中進行開發，可於其周邊建設遊客中心，並對原本希望在此處建設的渡假村在港口地區重新選址，並在周邊佈置水產研發和高附加價值之水產加工業。

近來設置的單車路線設施使茄萣可以融入單車旅遊這項在台灣日益流行的活動系統中。單車路線可以進一步擴張，從而串聯當地各名勝景點。而鄰近的水域又可以為環境教育、水上活動、遊船遊覽等提供機會。位於永安濕地教育中心旁的台灣鹽工宿舍群也可改造為學校學生和對歷史、鹽業感興趣者之教育場所。鄰近的村里同樣可以為遊客提供體驗地方文化的獨特機會，並為那些通常前往大城市謀生的本地年輕人提供工作機會。茄萣和崎漏所在的區位亦決定了當地民眾將有更多的機會從旅遊產業和設施中獲益。

茄萣濕地、1-4 號道路、經濟發展機會

為使茄萣的經濟能健康地發展，關於 1-4 號道路穿越茄萣濕地的爭論必須尋求妥善的解決方案。該解決方案須符合多重目標，並為整體區域謀求長期的利益，而非僅考慮少數在此地擁有財產的人。研究團隊認為如果 1-4 號道路可以沿著茄萣濕地的外圍設計，或者直接取消 1-4 號道路，將能使茄萣持續吸引前所未有的、多樣化的鳥類，使茄萣濕地成為國際級的賞鳥景點，以及文化和生態旅遊愛好者選擇的去處。

茄萣區還有許多其他的自然和文化資源。如果能夠策略性地開發這些資源，並將其與茄萣濕地日益發展的賞鳥活動相結合，則茄萣的地方經濟將能進一步發展，並有可能促使高雄市更加合理地對茄萣的基礎設施進行投資。在 2014 年 3 月與當地民眾互動的工作坊中，研究團隊和在地居民一起在地圖上標出了能吸引當地居民來茄萣旅遊，並可能進一步吸引外來遊客的觀光資源。研究團隊和台灣的合作者—地球公民基金會、茄萣生態文化協會、中華民國野鳥學會、高雄市野鳥學會、台灣濕地保護聯盟共同為茄萣的永續發展計畫制定了以下八項原則：

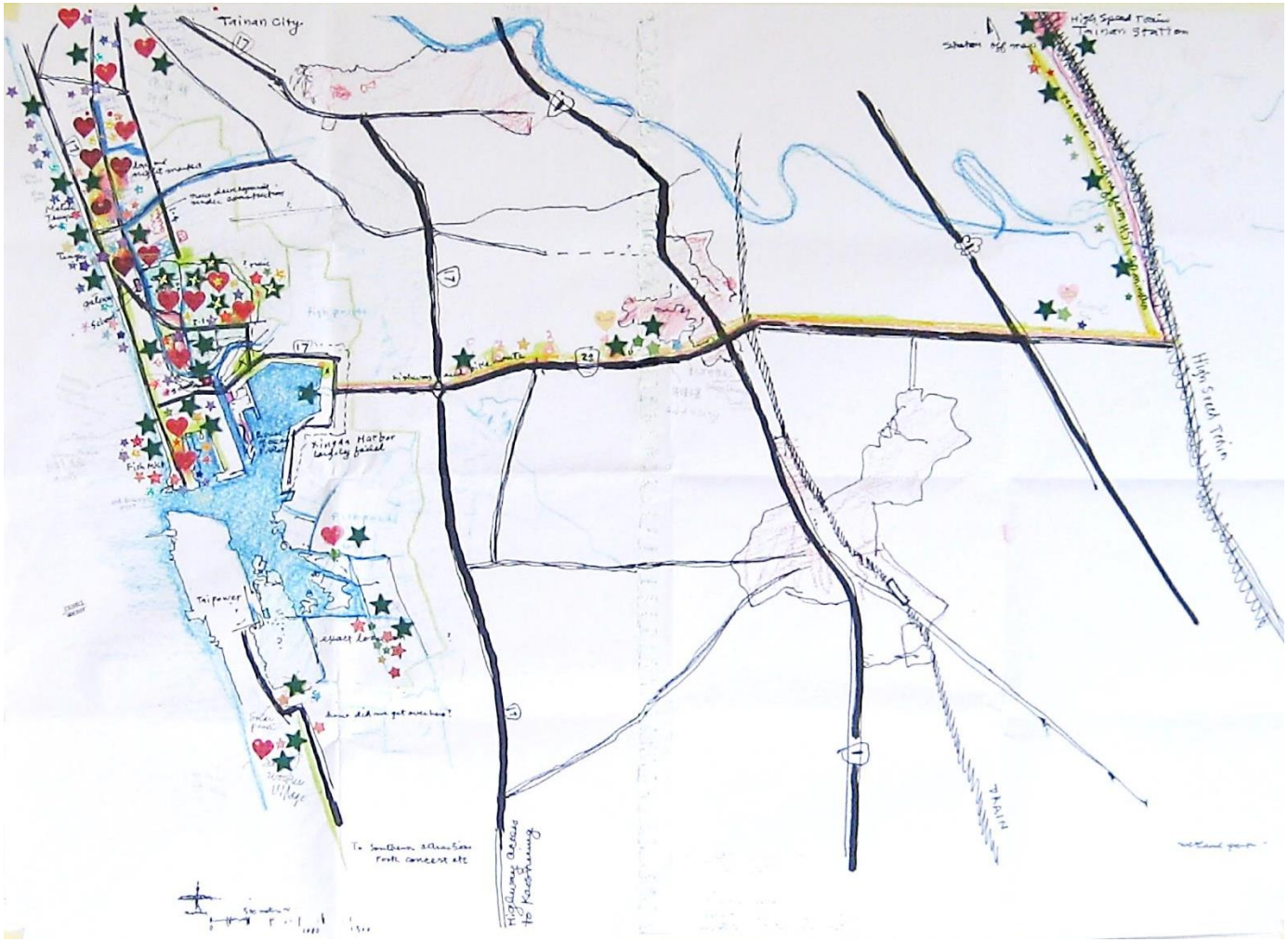
1. 充分利用茄萣的區位優勢，使其成為區域性的旅遊目的地。
2. 發展地區內部經濟，為當地居民提供就業機會。
3. 發掘並運用未被充分利用或認識的資源。
4. 維續並支持當地的漁業、水產養殖業、農業，從而為長期的食物安全和永續經濟發展提供基礎。
5. 為了地方的利益，保育獨特的自然資源。
6. 建設有助於地方居民之文化和生態旅遊設施。
7. 發揚茄萣文化傳統，為遊客帶來多樣而真實的體驗。
8. 在全球經濟和氣候變遷的條件下，確保茄萣持續繁榮。

在此原則下，研究團隊提出了一份保育和利用計畫。此一計畫不僅包括了茄萣濕地，還包括了鄰近的社區、崎漏、新的水岸公園、永安濕地、興達港、與台南高鐵站的聯繫。此計畫還考慮到當下重要的問題，包括區域交通、人口和台灣旅遊的變化趨勢，以及對海平面上升的科學預測。

The Strategy

Community members worked independently and as a group to list all the places to which they are devoted and places they thought visitors would enjoy, especially visitors who wanted to experience the “real” Jiading culture and environment.

Community Workshop



Hearts designated places community members are devoted to, what can be referred to as the sacred structure of Jiading. Stars marked places they thought visitors would enjoy. The resulting map indicated how important Old Jiading, Qilou, and Wu Sha Lin are to local people, how many attractions there are in the area, and how central Jiading and Yong-an Wetlands are to local life. It was also clear that there are attractions along Highway 28 to connect Jiading and the High Speed Train.

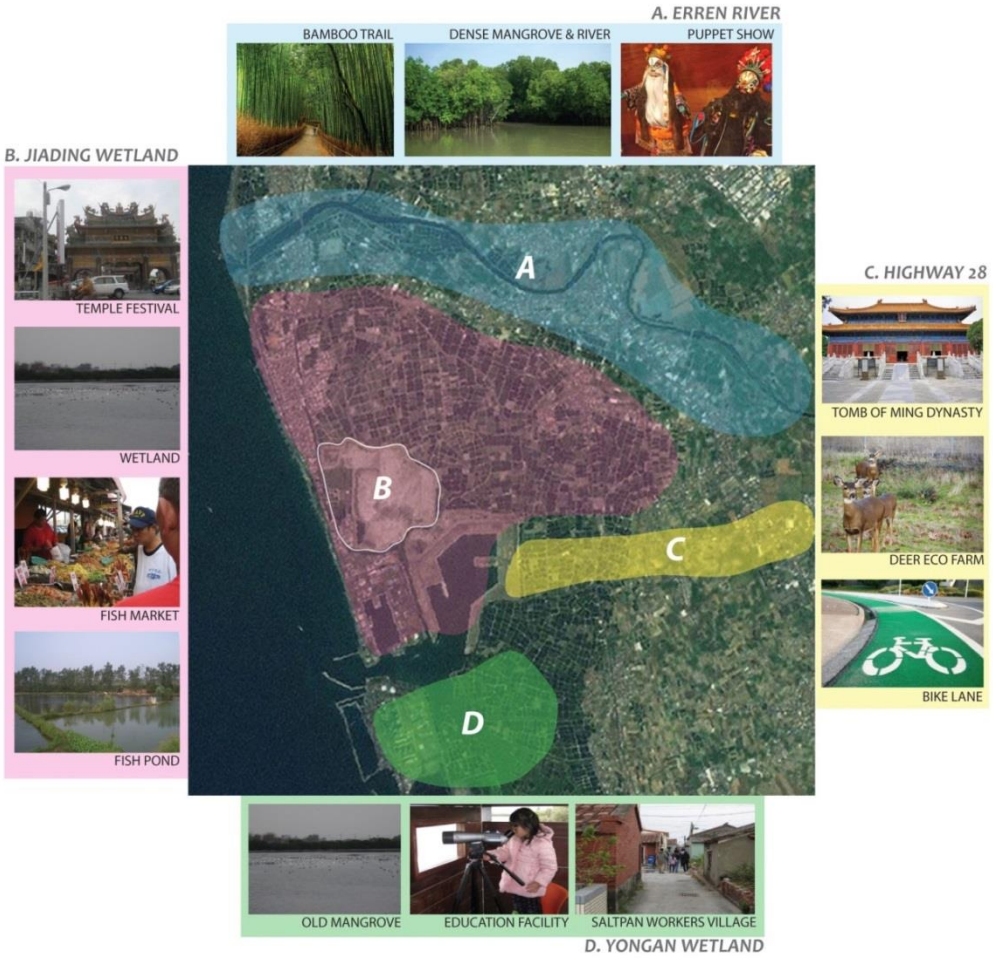
Community Map of Sacred Places to Share with Visitors

Making Jiading a Destination: Its Uniqueness

Pingpu Tribe+ Wetland + Fishery + Salt History

The team then catalogued the unique qualities that could make Jiading a destination for weekend visitors from Tainan and Kaohsiung as well as tourists from national and international locations. Over four dozen attractions were identified in three categories: learning about birds and the local ecosystems , shopping for local products, and experiencing local culture.

Three Categories of Attractions



The research team analyzed the categories of attractions, ranked them in terms of distinctiveness relative to other successful tourist economies, and developed a series of zones to create themes of unique experiences, including the Erren River; Jiading Wetland and nearby towns and villages, Highway 28, and Yong-an Wetland. Cultural and ecological tourism would be an overlay to the fishing, farming, and local industries that had grown from the natural resources of the region. It became apparent that a vital local economy had always depended and still depends upon the natural resources of the area. This has been the case since the time when the Pingpu Tribe inhabited the Jiading area.

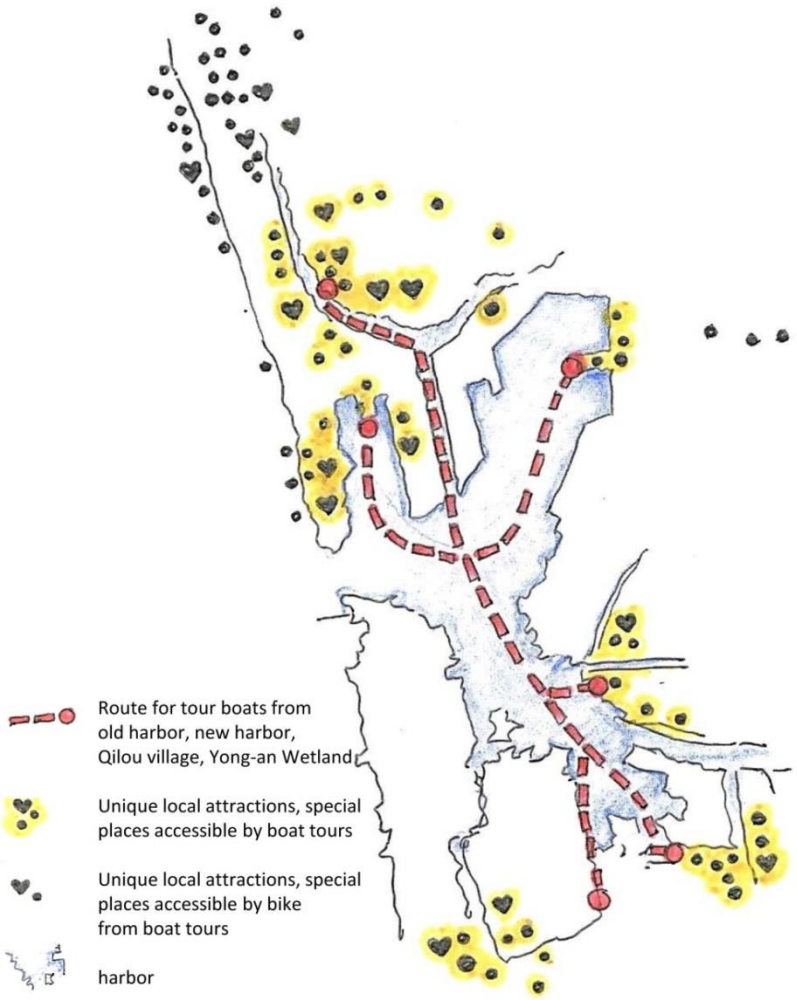
Attractions of Erren River, Jiading, Yong-an Wetland, and Highway 28

This led the team to consider how best to sustain the natural resources for long-term economic benefit. Taiwan's wetland conservation act provided a logical framework to achieve this. In Article 16, the Wetland Conservation Act outlines that zoning may be planned for classified wetlands. "Wetlands of International and National Importance, except under special circumstances as described in subparagraph III to subparagraph V in the preceding paragraph, may not be developed or built." The exceptions include development related to environmental education and other zonings conforming to the wise use principle. Wise use is defined in Article 4: "Referring to a timely, fittingly, moderately and adequately sustainable utilization of the biological resources, water resources and land resources that is achieved in a compatible approach within the wetland ecological capacity to maintain the quality and quantity of wetland resources in a stable condition." The team then developed a proposal for criteria of the Jiading Wetland. Based on suggestions from the Wetland Conservation Act and analysis of the Jiading Wetland, the proposed zoning includes conservation areas for habitat preservation and educational and recreation zones to promote ecotourism. Restoration and service areas are also included. This encourages continued biodiversity and habitat functionality while promoting economic development. Like many wetlands of international importance Jiading has been modified over time, but its seasonal shallow waters, wetland vegetation, roosting and foraging areas (both north and south of Road 1-1) offer ideal wetland habitat. The habitat that is essential for the Black-faced Spoonbill and other birds forms the Conservation Core. A primary visitor center would be located where Road 1-6 joins the harbor. A major recreation and education zone would be developed along Road 1-1. Secondary, educational nodes surround the wetland. A unique "local guide only" access trail would stimulate the economy in Qilou Village with a distinctive way to experience the wetland birds.

Highest Potential Land Use Zoning Based on Wetland Conservation Act

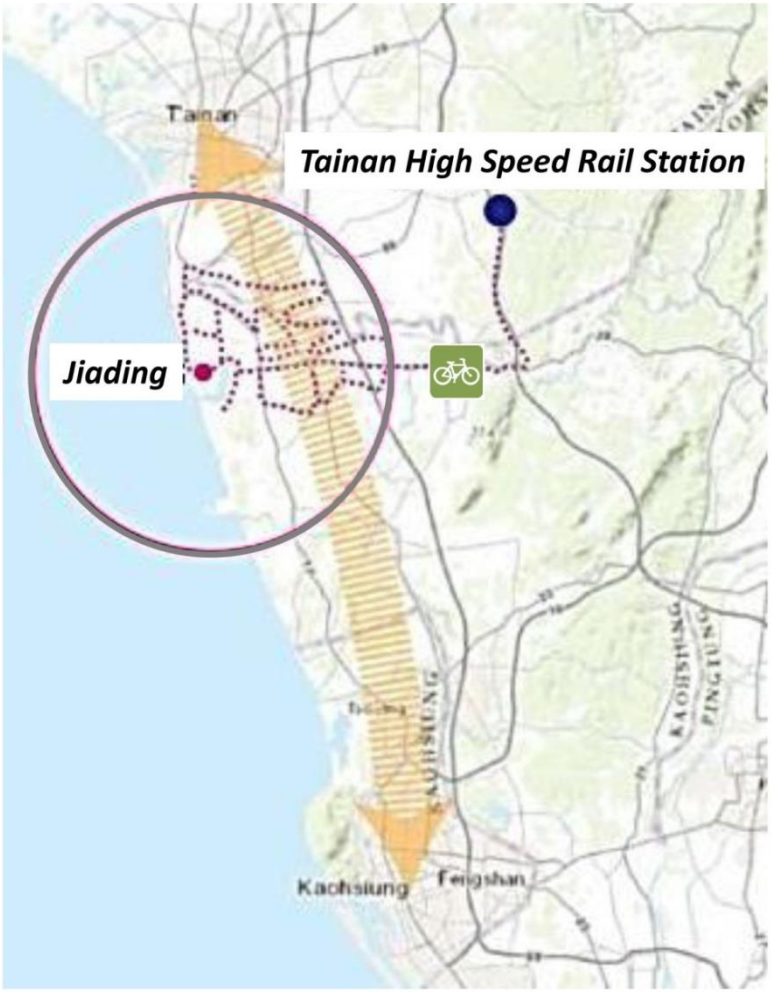
The Strategic Plan utilizes the special attractions of the Jiading area, and recommends the addition of visitor-serving facilities that are now lacking: especially a primary visitor center/museum with ample parking to reduce congestion in the towns and villages; overnight accommodations, mostly as small bed-and-breakfasts in existing homes; expanded programed visitor activities like boat and bicycle tours; and continued support for underlying fishing and farming economies.

Strategic Plan



Healthy mangroves, some likely 100 years old, the harbor, and inland waterways create a unique opportunity for eco-tourism. A Blueway Plan needs to be developed to take advantage of the many attractions accessible by boat. In other areas in Taiwan and elsewhere, boat tours are one of the most sought after visitor experiences that provide additional income for boating and fishing families. Jiading has distinctive advantages because the harbor waters allow small boats to give visitors a rare chance to experience much off the local culture and ecology.

Blueway Plan for Boat Tours



Jiading already has excellent bike trails that could be further developed locally so bikers could experience the villages and countryside without adding automobile or bus congestion in the towns. Improvements along Highway 28 would draw even more bikers who do the Taiwan loop, and designated bike routes could connect attractions around Jiading. Services and overnight accommodations for bikers would provide local employment.

Bike Trails

Although many natural resources and facilities exist in the Jiading area to create a world-class cultural and ecotourism economy, there are multiple opportunities for local entrepreneurs to develop unique experiences that would enhance the culture and environment and stimulate job creation, especially jobs that local people can attain and advance.

Opportunities for Local Entrepreneurs, Jobs for Local People

Graphic Captions 圖表說明

1. **Page 8 Flight Initiation Distance** Having adequate distance from threat is the most critical spatial consideration in determining if habitat is adequate and therefore valuable for the spoonbill. When this metric is applied to Jiading Wetland, and the proposal to build Road 1-4 through the wetland, at least two prime roosting sites will be impacted and likely rendered unsuitable for the spoonbill.
   飛行起始距離。距離威脅有足夠的距離是黑面琵鷺選擇合適棲息地最關鍵的空間考量。運用此標準檢視茄苳濕地時，推論 1-4 號道路將導致濕地內兩個主要的棲息地受到影響，並有可能使它們無法繼續為黑面琵鷺所使用。
2. **Page 9 Threat of Island Effects** Loss of habitat from fragmentation is a major cause of bird extinctions. This may happen in the B1 and B2 areas of Jiading Wetlands if Road 1-4 is built as proposed. The recently built Roads 1-1 and 1-6 have divided the Jiading Wetland into smaller pieces and diminished its value as habitat. But the northern and southern halves of the wetland are still large enough to attract birds. The above map shows areas presently used by the Black-faced Spoonbill.
   孤島效用的威脅。由於棲地破碎化而導致的棲息地喪失是鳥類滅絕的主要原因。如果 1-4 號道路按原方案進行建設，則此情況將可能在茄苳濕地的 B1 和 B2 區域發生。已完工啟用的 1-1 號道路和 1-6 號道路已經將茄苳濕地切割為較小的區塊，並降低了棲息地的生態價值。然而濕地的南北兩半仍然具有足夠的面積吸引鳥類。上圖展示了目前正由黑面琵鷺使用的區域。
3. **Page 11 Jiading and Yong-an Wetlands as One Ecological System** The Black-faced Spoonbill will typically forage 9-14 km from a roosting site. It is known that the birds move regularly between the Jiading and Yong-an Wetlands. Both of these wetlands act as a single unit because birds will travel between the two sites to forage, roost, or flee from disturbance. Protecting both of these wetlands from further development is essential to the long-term survival of a sustainable population of spoonbills. Additionally, many other birds use both sites daily or seasonally.
   茄苳濕地和永安濕地串連為一個生態系統。黑面琵鷺通常會飛離棲息地 9-14 公里進行覓食。目前已知黑面琵鷺會在茄苳濕地和永安濕地間頻繁往來，在兩個濕地中覓食及棲息，並在受到干擾時從一個濕地飛往另一個濕地。因此，這兩個濕地均是黑面琵鷺生存的重要棲地單元。保育這兩個濕地使其免於開發的壓力，對黑面琵鷺族群的永續發展是非常必要的。此外，許多其他鳥類也會日常性或季節性地使用這兩個棲息地。
4. **Page 18 Alternative Locations for Road 1-4** Even with a flawed weighting system, Alternative 1 does not score significantly better than other alternatives. If a proper weighting system, acceptable as best practices in international environmental assessment, is used,

Alternative 1 scores the worst. “No build” scores best; Alternatives 3, 4, and 5 score much better than Alternative 1.

1-4 號道路的替代性位置。儘管採用了有缺陷的評分系統，替代方案 1 （推薦方案）相比於其它的替代方案也沒能脫穎而出。如果使用一個合理的評分系統，推薦方案的得分很有可能是最低的。“零方案”可能得分最高，而替代方案 3、4、5 的得分也將遠高於替代方案 1。

5. **Page 22 Community Workshop** Community members worked independently and as a group to list all the places to which they are devoted and places they thought visitors would enjoy, especially visitors who wanted to experience the “real” Jiading culture and environment.

   社區工作坊。 社區成員獨立或合作列出了所有他們喜愛的地區，以及他們認為遊客可能會感興趣的遊覽區域，特別是那些可以體驗到原汁原味的茄苳文化和環境的區域。

6. **Page 23 Community Map of Sacred Places to Share with Visitors** Hearts designated places community members are devoted to, what can be referred to as the sacred structure of Jiading. Stars marked places they thought visitors would enjoy. The resulting map indicated how important Old Jiading, Qilou, and Wu Shu Lin are to local people, how many attractions there are in the area, and how central Jiading and Yong-an Wetlands are to local life. It was also clear that there are attractions along Highway 28 to connect Jiading and the High Speed Train.

   可以與遊客分享的景點分佈圖。圖中標示出社區成員們所喜愛的地點，這些地點構成了茄苳人民的心靈家園。星型圖案標示出社區居民認為遊客可能會喜愛的旅遊地點。這張圖表達了茄苳舊聚落、崎漏、烏樹林對當地居民的重要性、旅遊景點的數量，以及茄苳濕地和永安濕地對在地生活的重要性。這張圖同樣說明了連接茄苳和高鐵站的省道台 28 線兩側已經存在很多吸引遊客的場所。

7. **Page 24 Three Categories of Attractions** The team then catalogued the unique qualities that could make Jiading a destination for weekend visitors from Tainan and Kaohsiung as well as tourists from national and international locations. Over four dozen attractions were identified in three categories: learning about birds and the local ecosystems , shopping for local products, and experiencing local culture.

   三種類型的景點。研究團隊按照場所的特質，將那些可能吸引台南、高雄週末遊客以及全台和國際遊客的場所進行了分類。超過 48 個場所被按照以下的三個類別進行分類：學習鳥類和當地生態環境的場所、購買當地物產的場所和體驗當地文化的場所。

8. **Page 25 Attractions of Erren River, Jiading, Yong-an Wetland, and Highway 28** The research team analyzed the categories of attractions, ranked them in terms of distinctiveness relative to other successful tourist economies, and developed a series of zones to create

themes of unique experiences, including the Erren River; Jiading Wetland and nearby towns and villages, Highway 28, and Yong-an Wetland. Cultural and ecological tourism would be an overlay to the fishing, farming, and local industries that had grown from the natural resources of the region. It became apparent that a vital local economy had always depended and still depends upon the natural resources of the area. This has been the case since the time when the Pingpu Tribe inhabited the Jiading area.

二仁溪、茄萣、永安濕地、省道台 28 線周邊的景點。研究團隊按照分類對這些景點進行研究，按照它們與其他成功旅遊景點的比較進行了評分，並按照旅遊體驗劃分了一系列的功能區域。這些區域包括了二仁溪、茄萣濕地和鄰近的村里、省道台 28 線、永安濕地。文化和生態旅遊可以與當地的漁業、農業、工業相結合。顯而易見的是，有活力的地方經濟往往都是仰賴當地的自然資源而發展的。這樣的觀點自平埔部落開始在茄萣居住時就已經被不斷地被驗證。

9. **Page 26 Highest Potential Land Use Zoning Based on Wetland Conservation Act** This led the team to consider how best to sustain the natural resources for long-term economic benefit. Taiwan's wetland conservation act provided a logical framework to achieve this. In Article 16, the Wetland Conservation Act outlines that zoning may be planned for classified wetlands. "Wetlands of International and National Importance, except under special circumstances as described in subparagraph III to subparagraph V in the preceding paragraph, may not be developed or built." The exceptions include development related to environmental education and other zonings conforming to the wise use principle. Wise use is defined in Article 4: "Referring to a timely, fittingly, moderately and adequately sustainable utilization of the biological resources, water resources and land resources that is achieved in a compatible approach within the wetland ecological capacity to maintain the quality and quantity of wetland resources in a stable condition." The team then developed a proposal for criteria of the Jiading Wetland. Based on suggestions from the Wetland Conservation Act and analysis of the Jiading Wetland, the proposed zoning includes conservation areas for habitat preservation and educational and recreation zones to promote ecotourism. Restoration and service areas are also included. This encourages continued biodiversity and habitat functionality while promoting economic development. Like many wetlands of international importance Jiading has been modified over time, but its seasonal shallow waters, wetland vegetation, roosting and foraging areas (both north and south of Road 1-1) offer ideal wetland habitat. The habitat that is essential for the Black-faced Spoonbill and other birds forms the Conservation Core. A primary visitor center would be located where Road 1-6 joins the harbor. A

major recreation and education zone would be developed along Road 1-1. Secondary, educational nodes surround the wetland. A unique “local guide only” access trail would stimulate the economy in Qilou Village with a distinctive way to experience the wetland birds.

基於《濕地保育法》最有可能的土地利用分區。研究團隊檢討如何藉最大程度的自然資源永續利用以獲得長期的經濟效益。《濕地保育法》為達成此目標提供了邏輯框架。《濕地保育法》第十六條中明定重要濕地需要進行分區管制。其具體規定，“國際級、國家級重要濕地，除前項第三款至第五款之情形外，不得開發或建築”例外的情形包括了與環境教育有關的開發和其他明智利用形式。法案第四條定義了明智利用的形式： 明智利用指在濕地生態承載範圍內，以兼容並蓄方式使用濕地資源，維持質及量於穩定狀態下，對其生物資源、水資源與土地予以適時、適地、適量、適性之永續利用。研究團隊據此確定了茄萣濕地的利用方案。基於《濕地保育法》的精神和對於茄萣濕地的分析，研究團隊建議的分區包括了以棲息地保育為主的核心保育區和以推動生態旅遊為主的環境教育區與遊憩區。分區中也包括了生態復育區和管理服務區。這樣的分區在促進經濟發展的同時，也可以保證生物多樣性和棲息地的生態功能。如同許多國際級濕地那樣，茄萣濕地在歷史上也受到各種影響而不斷改變。然而茄萣濕地季節性的低水位、濕地植被、1-1 號道路兩側的棲息和覓食區共同形成了良好的棲息地條件。而這樣一個可以為黑面琵鷺和其他鳥類所使用的濕地正是整個保育工作的核心。在 1-6 號道路和港口的交界處可以設置一個重要的遊客中心。而沿著 1-1 號道路則可以配置主要的遊憩和教育區。其次，可以圍繞濕地設置一系列的環境教育場所。一條僅可由當地嚮導帶領穿越的步行路徑更可以帶來對濕地鳥類的獨特體驗，並促進崎漏社區的經濟發展。

10. **Page 27 Strategic Plan** The Strategic Plan utilizes the special attractions of the Jiading area, and recommends the addition of visitor-serving facilities that are now lacking: especially a primary visitor center/museum with ample parking to reduce congestion in the towns and villages; overnight accommodations, mostly as small bed-and-breakfasts in existing homes; expanded programed visitor activities like boat and bicycle tours; and continued support for underlying fishing and farming economies.

    策略方案。本計畫之策略乃利用茄萣地區獨特的景點資源，並且建議增設目前缺乏的旅遊服務設施。方案中特別強調需要設置一個主要的遊客服務中心或博物館，並規劃充足的停車設施，以緩解周邊的交通擁塞情形；設置旅遊住宿設施，特別是利用現有住宅經營提供早餐和客房的民宿；擴展旅遊活動項目，開發單車和遊船旅遊；為當地支柱性的漁業和農業經濟提供支持。

11. **Page 28 Blueway Plan for Boat Tours** Healthy mangroves, some likely 100 years old, the harbor, and inland waterways create a unique opportunity for eco-tourism. A Blueway Plan needs to be developed to take advantage of the many

attractions accessible by boat. In other areas in Taiwan and elsewhere, boat tours are one of the most sought after visitor experiences that provide additional income for boating and fishing families. Jiading has distinctive advantages because the harbor waters allow small boats to give visitors a rare chance to experience much off the local culture and ecology.

水路旅遊規劃。 欣欣向榮的紅樹林（有些接近有百年的歷史）、港口、水道為生態旅遊提供了獨特的機會。考量許多景點可以透過遊船連接，當地很適合規劃經營水上旅遊。在台灣和世界上的其他地方，遊船旅遊是最受歡迎的旅遊形式之一。經營遊船和以捕魚為生的家庭也可以從中獲益。茄萣地區發展遊船旅遊的獨特優勢在於港口水道可以供小型船隻通航，進而為遊客創造充分體驗當地文化和生態的獨特體驗。

12. **Page 29 Bike Trails** Jiading already has excellent bike trails that could be further developed locally so bikers could experience the villages and countryside without adding automobile or bus congestion in the towns. Improvements along Highway 28 would draw even more bikers who do the Taiwan loop, and designated bike routes could connect attractions around Jiading. Services and overnight accommodations for bikers would provide local employment.

單車路線。茄萣已經具備了條件良好的單車路線。這些路線可以進一步發展，使得騎行單車的遊客得以體驗當地的鄉村風貌，而不會造成茄萣市區內出現機車或公車交通擁塞的情形。若沿省道台 28 線兩側進行道路改善甚至可以進一步吸引環島騎行的遊客。此外，單車路線還可以串聯茄萣周邊的旅遊景點。相關的服務設施和住宿服務同樣能夠促進地方就業。

13. **Page 30 Opportunities for Local Entrepreneurs, Jobs for Local People** Although many natural resources and facilities exist in the Jiading area to create a world-class cultural and ecotourism economy, there are multiple opportunities for local entrepreneurs to develop unique experiences that would enhance the culture and environment and stimulate job creation, especially jobs that local people can attain and advance.

地方企業發展機會及在地居民就業。除了藉由茄萣既有的自然資源和設施能創造世界級的文化與生態旅遊經濟模式之外，地方企業還有更多元的機會發展特殊的體驗型經濟，反饋增進在地文化和自然特色，並為地方人創造就業機會。

Credits

From February 24 through March 19, 2014 graduate students in the University of California, Berkeley, Department of Landscape Architecture and Environmental Planning's LA 205 studio, an advanced environmental planning course, worked with SAVE International to launch research on Road 1-4, proposed to run through Jiading Wetland, in the Jiading District of Kaohsiung City, Taiwan. They researched habitat requirements for the Black-faced Spoonbill and other species of concern found in the wetlands, conducted a review of relevant planning and environmental policy documents, critically evaluated the environmental impact assessments conducted for the road, and determined the area's potential for ecotourism. Marcia McNally, Randy Hester, Barbara Butler, Jan Eiesland, Kirsten Podolak, Kelly Janes, and Derek Schubert from SAVE International worked with the students throughout – sometimes in studio, sometimes from Taiwan via Skype. The Berkeley team; Emily Alvarez, Stephanie Brucart, Allison Jacobson, Yang Ju, Saori Ogura, and Serin Park; along with GSI Jen Natalie and Professor John Radke, made a significant contribution to this research. Their work is combined with SAVE's own research to produce this report. In addition to Schubert, Hester, and McNally SAVE members Fiona Cundy, Tami Church, Shanna Atherton, Jing Ma, Chia-ning Yang, Wenling Tu, and Kinya Shiraishi conducted the on-site field work. Hsiao-Wen Wang, Pin Han-Kuo, and Po-Hsiu Kuo of National Cheng Kung University's Hydraulic and Ocean Engineering Department provided important background data and maps. Kent Lin, Yi-Jen Shie, Kun-Hai Lin, He-Tai Cheng provided invaluable input while SAVE worked in Taiwan.

SAVE (Spoonbill Action Voluntary Echo) International's mission is to save the endangered Black-faced Spoonbill (*Platalea minor*) from extinction by protecting important habitat and cultures while promoting sustainable development throughout the bird's migratory flyway. Founded in 1997, SAVE International is a volunteer group of professors, students, and staff from the University of California, Berkeley (UC Berkeley); Fukuoka University; and National Taiwan University. SAVE campaigns against threats to spoonbill habitat, conducts research on spoonbill habitat requirements, raises international awareness to stop threats to habitat, promotes alternative sustainable development, and collaborates with local groups to develop comprehensive plans where there is Black-faced Spoonbill habitat.

編者名單

2014 年 2 月 24 日至 3 月 19 日，美國加州大學柏克萊分校景觀建築與環境規劃系、區域與都市計畫系 2014 年碩士班的部份師生與國際黑面琵鷺後援聯盟（SAVE International）共同對計畫穿越高雄市茄萣區茄萣濕地的 1-4 號計畫道路進行了相關研究。研究包括了茄萣濕地中黑面琵鷺及其他物種對棲息地的需求，相關計畫、環保法規、1-4 號道路環境影響說明書的檢討，以及茄萣區域發展生態旅遊之可行性分析。來自黑面琵鷺後援聯盟的 Marcia McNally, Randy Hester, Barbara Butler, Jan Eiesland, Kirsten Podolak, Kelly Janes, Derek Schubert 與學生們透過課堂（在柏克萊期間）和網路（在台灣期間）的方式對此一研究進行討論。來自加州大學柏克萊分校的 Emily Alvarez, Stephanie Brucart, Allison Jacobson, Yang Ju, Saori Ogura, and Serin Park 的學生團隊，以及他們的助教 Jen Natalie 和老師 John Radke 教授對此次研究做出了重要的貢獻。加州大學柏克萊分校學生團隊的課程報告和國際黑面琵鷺後援聯盟的研究，共同形成了這份報告書。此外，國際黑面琵鷺後援聯盟的成員們，包括 Marcia McNally, Randy Hester, Barbara Butler, Derek Schubert, Fiona Cundy, Tami Church, Shanna Atherton, Jing Ma, Chia-ning Yang, Wenling Tu, Kinya Shiraishi 在茄萣進行了現場調查。來自台灣國立成功大學水利及海洋工程學系的 Hsiao-Wen Wang, Pin Han-Kuo, Po-Hsiu Kuo 為本次研究提供了重要的背景資訊和地圖。 Kent Lin, Yi-Jen Shie, Kun-Hai Lin, He-Tai Cheng 亦為國際黑面琵鷺後援聯盟在台灣進行的現場調查提供了寶貴的協助。

國際黑面琵鷺後援聯盟，即 SAVE(Spoonbill Action Voluntary Echo) International 的使命是保護瀕臨滅絕的黑面琵鷺(*Platalea minor*)，及其棲息地和相關文化，推動相關地區的永續發展。成立於 1997 年的國際黑面琵鷺後援聯盟是一個由來自加州大學柏克萊分校（University of California, Berkeley）、福岡大學（Fukuoka University）和國立台灣大學（National Taiwan University）的師生員工共同組成的志願者團體。國際黑面琵鷺後援聯盟致力於反對威脅黑面琵鷺棲息地的行為，進行黑面琵鷺棲息地的現地研究，提升國際社會對黑面琵鷺棲息地的關注，倡導替代性的永續發展，並與地方團體協力合作，共同對黑面琵鷺棲息地及所在地區展開綜合性的規劃。