行政院所屬各機關出國報告
（出國類別：國際會議）

參　與

聯合國氣候變化綱要公約(UNFCCC)

協約國第 21 次會議(COP21)

相關活動報告

服務機關：交通部中央氣象局
姓名職稱：程家平主任
派赴國家：法國
出國期間：104 年 12 月 03 日至 13 日
報告日期：105 年 03 月 08 日

摘　要

此行由中央氣象局指派參與行政院團，赴法國巴黎參加「聯合國氣候變化綱要公約第 21 次締約國大會暨京都議定書第 11 次締約國會議(COP21/CMP11)」相關週邊會議活動。主要參與行政院官方團第 2 週活動(104 年 12 月 4 至 12 日)，依行政院團整體任務分工，中央氣象局屬科研應用組，在參與此次活動中，除出席 COP21 第二週的相關週邊會議外，並針對再生能源、海洋衝擊、極區衝擊、氣候推估等氣候科學研究與氣候變遷調適應用發展趨勢進行觀察，瞭解各國氣象單位對氣候的監測、預報與服務能力。此外，並尋求透過氣象國際合作及跨領域調適應用研發，使我國能強化對極端氣候事件掌握及對自身氣候服務能力的提升，進而提供防災或經濟決策的氣象應用資訊，提升我國全體的氣候適應力，減輕災損並創造經濟效益。

關鍵詞：氣候推估、氣候衝擊、氣候風險管理、氣候變遷調適、氣候應用、全球氣候服務框架

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壹、 會議背景與目的

今年 UNFCCC 舉辦的 COP21 於法國首都巴黎舉行，會議期間為 2015 年 12 月 1 日至 14 日。它包括第 21 次締約國大會（COP21）、京都議定書的締約國會議第 11 次會議（CMP11）。三個附屬機構（SBS）會議：附屬科學和技術諮詢的第 43 屆會議（SBSTA43）和附屬履行機構（SBI43），以及特設工作組第 2 次會議的第 12 部分德班平台增強行動（ADP2-12）。各國在會前已紛紛承諾將在大會上簽訂新的氣候協議，以彌補哥本哈根氣候大會(COP15)上未能達成協議的遺憾。因此，COP21 預期是聯合國經歷 20 多年談判後，第一次有機會達成具法令效力及國際認可的氣候協議會議，以取代原訂 2012 年到期卻被延長至 2020 年的《京都議定書》，並確保地球升溫低於 2℃的共同目標。

巴黎 COP21 大會匯集了超過 3 萬 6 千餘人參加，其中包括 150 個國家元首，2 萬餘位政府官員，6 千餘個非政府組織(NGO)，9 千餘位機構代表及近 4 千位媒體代表，為歷屆氣候會議之最；此外，並有 187 個國家提交「國家自定預期貢獻」(INDC)來支持減緩目標達成。我國政府亦於 2015 年 6 月立法通過《溫室氣體減量及管理法》，主動提出「國家自定預期貢獻」，設定為 2030 年溫室氣體排放量為依現況發展(Business As Usual；BAU)趨勢減量 50%，即相當於 2005 年總排放量再減 20%，而於 2050 年降至 2005 年總排放量 50%以下的目標，展現我國積極減碳的企圖心。

此行由中央氣象局指派，參與行政院官方團，除出席 COP21 第二週的相關週邊會議外，並與相關國際組織以及各國氣象(候)研發和應用單位接觸進行議題討論與交流，以針對氣候科學資訊和氣候變遷資料應用發展趨勢進行觀察，瞭解各國氣象單位和國際組織對氣候的監測、預報與服務能力。此外，並尋求透過氣象國際合作及跨領域調適應用研發，使我國能強化對極

端氣候事件掌握及對自身氣候服務能力的提升，進而提供防災或經濟決策的氣象應用資訊，提升我國全體的氣候適應力，減輕災損並創造經濟效益。

表一、COP21 第二週會議議程大綱

Day/Time	Second Week (7 – 11 December)			
	10:00 to 13:00	Lunch Break[2]	15:00 to 18:00	Evening[3]
Monday 7th	Joint High-Level Segment (HLS) of the COP and CMP (National statements)	*Joint side-event of UNFCCC and UNEP: Presentation of UNEP 2015 Emissions gap report* *Update on the ICA process*	Joint High-Level Segment (HLS) of the COP and CMP (National statements)	
	Informal consultations		Informal consultations	
	LPAA Focus: Renewable energy		LPAA Focus: Energy efficiency and access	
Tuesday 8th	Joint High-Level Segment (HLS) of the COP and CMP (National statements)	*Lessons learned in implementing gender-responsive climate policy*	Joint High-Level Segment (HLS) of the COP and CMP (Statements by observers upon completion of national statements)	Reception by the Presidency (Head of Delegations only)
	Informal consultations		Informal consultations	
	LPAA Focus: City and sub-nationals	LPAA focus: Business	LPAA Focus: Innovation	
	Gender Day			

Day/Time	Second Week (7 – 11 December)			
	10:00 to 13:00	Lunch Break[2]	15:00 to 18:00	Evening[3]
Wednesday 9th	Informal consultations		Conclusion of negotiations for the Paris Agreement and related decisions	
Thursday 10th	COP and CMP, Adoption of completed decisions and conclusions		COP and CMP, Adoption of completed decisions and conclusions	
Friday 11th	CMP closing, Adoption of decisions		COP closing, Adoption of the Paris agreement and related decisions	

貳、 參與會議過程與重點

本次 COP21 相關的週邊會議超過 200 場次，相關的會議內容分為"減量"、"調適"、"與二者皆有關"、"其它"等四大類分。由於中央氣象局業務的性質是屬於"調適"工作較前端的氣象(候)資料提供與應用服務，因此所選擇參與研討的議題，以和氣象(候)及相關應用有關且由官方機構主辦的為主(相關參與的研討議題，如附錄一)，以儘量擴大接觸氣候變遷調適相關的應用領域。此外，亦於 12 月 5 日參加由國際氣候發展智庫(ICDI)以「公民社會在東亞氣候談判及國家氣候行動之角色」(The Role of Civil Society in East Asia on the Climate Negotiation and National Climate Actions)為題所舉辦的週邊會議(提出簡報如附錄二)；另於 12 月 10 日參加由台達電基金會(DEF) 以「綠建築的巨大減量潛能」(The immense mitigation potential of green buildings)為題所舉辦的週邊會議(提出簡報如附錄三)。同時，於會期間亦與我友邦索羅門群島進行氣象早期預警系統的建置進行討論，並與世界氣象組織(WMO)、世界衛生組織(WHO)、聯合國開發計劃署(UNDP)、聯合國環境規劃署(UNEP)等多個國際組織，就各組織在氣候變遷相關活動中與氣象有關的應用技術及互動合作情形交換意見。在此特別提出說明如下：

一、與會工作重點：

(一)掌握 WMO 的全球氣候服務框架(GFCS)所推動之跨領域氣候風險調適應用的階段性方案和計畫

(二)瞭解基礎氣候科學和全球暖化對各應用領域所造成的衝擊，以及可能

的調適措施

(三)探查各國氣象機構在氣候變遷相關議題所扮演的角色(研究分析/監測推估/機關社會互動)和實際作為(資料提供/知識宣導/應用服務)

(四)分享我國氣候變遷調適決策應用服務經驗，尋求與各國氣象機構在氣候調適議題上的合作可能性(資料交換/技術交流/應用合作)

二、各項研討議題重點(依時間)：

(一)科技整合朝向百分百再生能源

1. 若依照 IPCC 預設情境，將暖化控制在 2 度 C 內，須在 2035 年達到再生能源比例超過 50%。舉瑞典為例，生質能、水力及風能總和已超過 50%，正邁向一個無化石能源的國家。

2. 所有的再生能源科技需要同時在一個區域內進行應用，包括太陽能、風能、地熱、水力及生質能，對各種來源的天氣資料要更精準掌握。

3. 生質能是具有高度潛力的再生能源，在個案研究國家中均佔有高度比例。

4. 在所有已開發國家能源政策發展上，能源稅均是停止化石能源使用比例以提高再生能源比例的關鍵。

(二)COP21 納入海洋與海岸議題

海洋不但覆蓋了地球 70%的面積，同時也提供地球上 96%的生物棲息空間，全球將近 50%的生產力大多來自海洋中的微藻，洋流的循環同時也提供海洋熱能運輸的功能，海洋也是主要的石油與天然氣來源，也可提供風

力與潮汐發電做為替代，全世界 75%的大城市位於海岸沿線，約 50%的人口傍海而居，海洋可緩和陸地上的氣候變遷，去除 28%的二氧化碳排放，減少大氣增溫(但同時造成海洋酸化)，吸收全球暖化的熱能(但造成海洋暖化)。今年是 COP 會議第 3 次舉辦海洋相關的系列周邊會議，以瞭解海洋的現況、受到氣候變遷的影響與變化以及在調適上所佔的份量，相關重點如下：

1. 強化對 CO2 排放的限制，以避免對海洋生態、海岸、島嶼社群造成更嚴重的影響。

2. 發展並施行與海洋有關的減量方法，包括：船舶的 CO2 減量、海洋的再生能源、海洋的碳捕捉及儲存。

3. 整合國家、區域、地方層級的海岸與海洋機構，實施以生態系統為基礎的調適策略，建立海岸及島嶼社群的管理能力、恢復力以及調適能量。

4. 由全球基金與財務機制給予海岸及島嶼社群所進行的調適與減量適足的經費支持。

5. 強化全球海洋的觀測、研究、及相關能力建構，包括：支持 IPCC 整合及更新 AR5 對海洋角色的相關科學發現，提出對海洋的特別報告書。

6. 持續性的海洋觀測應納入國家的承諾;建立區域的海洋中心，強化脆弱國家的技術能力發展，以促進各國間跨領域的觀測和海洋與氣候研究的合作。

7. 透過教育和宣導拓展個人及群眾對海洋瞭解與認知，和氣候變遷對小島發展國及海岸社群帶來的風險，並鼓勵群眾對於減量和調適的支持。

(三)WMO 與 WHO 說明氣候變遷對公衛的衝擊

1. 氣候變遷使空氣污染更加惡化，對於人類健康造成嚴重影響，北京的案例被多次提出。

2. 氣候變遷與健康議題應依循聯合國 9 月所發表的永續發展目標 SDG 脈絡，放入決策考量。

3. 氣候變遷對健康影響是人權議題。

4. 乾淨能源的使用可以減緩氣候變遷所造成的健康衝擊。

5. 以加州為例說明減少空氣污染的施政作為並不會戕害經濟發展。

6. 氣候變遷、健康、與生物多樣性的三者有緊密的關係。

(四)冰雪圈的不可恢復氣候衝擊之風險

採用 AR5 和後續研究的結果，並基於在北極、南極以及阿爾卑斯等區域的不可逆動力機制，研究在不同的溫度及二氧化碳濃度下，地球氣候系統永久改變的風險。並討論相關海平面上升、碳釋出和極區海洋酸化的問題。會議所討論的重要內容包括：

1. 在觀測及模式的模擬中，北極海冰減少直接肇因於 CO2 濃度的增加。因此未來海冰的演變將繫於未來 CO2 的排放。依目前 CO2 的排放速率，北極夏季海冰並將在本世紀中完全消失。

2. 只有非常強烈及快速地減少 CO2 的含量，才能阻止在世紀末北極夏季海冰的消失。目前的 INDC 並不足以達到這個目標。

3. 海冰的反照率將因暖水增多海冰減少而增加極區對太陽熱輻射的吸收，此現象將導致暖水更形增多，海冰更形減少的惡性循環，而益發不易回復的正常循環。

4. 凍土層是地球上最大的脆弱儲碳區，其總共碳含量約為 1500GT(十億噸)。依據 IPCC 的 AR5 報告，本世紀末凍土內的冰層溶解將導致 30%至 70%的凍土消失，而造成凍土內物種的改變。

(五)十字路口的 IPCC：強化 IPCC 對 UNFCCC 的有用性

IPCC綜整了大量的科學研究成果,並與政策制訂者溝通所發現的事實,在氣候變遷上扮演關鍵的角色,惟也受到相當多批評。會議中討論,在 2015 年巴黎氣候峰會後,IPCC 將面臨何種問題與挑戰。所討論的相關重點包括：

1. IPCC AR6 需要甚麼樣的新內容以提升被使用的價值: 建議針對升溫 1.5 度到 3 或 4 度提出各種情境模擬。
2. 尺度上針對國家及地方層級的情境進行更仔細的評估,並做整個 21 世紀情境推估。
3. 針對危險狀態進行仔細分析,說明採取作為或不作為的危險情境差異。
4. 對於各國 INDC 如何達成提供政策協助資訊及工具。
5. 在資訊傳遞上善用社群網絡,如 facebook, twitter, youtube 等平台,增加年輕世代對於 IPCC 報告內容的理解,使用通俗易懂的語言,同時增加圖片以及影像檔的大量使用。
6. IPCC 作者的增補選取過程應該增加發展中國家的比例,並且增加社會科學領域和自然科學領域的互動,以求各小組報告能夠有更好的整合性。
7. 科學家與決策者應更緊密的結合成工作夥伴,使報告內容能真正為政策所用。

8. IPCC 必須謹慎思考如何將訊息傳遞給整個社會,以達其功效。

(六)經由有效的天氣氣候早期警報系統建構有恢復力的太平洋

本會議由太平洋環境計畫秘書處 SPREP 主辦，邀請 WMO 新任秘書長及萬那度代表、東加王國氣象局長、芬蘭政府外交顧問與會，討論如何強化太平洋島國對氣候變遷的韌性(世界氣象組織在 COP21 會議所發布的相關訊息摘錄如附錄四)。

1. 氣候變遷對於小島國衝擊相當大，特別是極端氣候災害的損失甚鉅，亟須強化天氣氣候早期警報系統，特別是對於社區聚落。

2. WMO 新任秘書長表示：未來對小島國氣象協助重點包括協助該區域的國家氣象單位(NMHSs)能力建構、發展早期預警系統、強化觀測能力、資料交換、以及合作研究。

3. 聯合國社會經濟發展委員會 UNESCAP 執行長表示未來須強化太平洋小島國家面對颱風或熱帶氣旋的災害應變能力，對於海岸及海嘯等災害發展早期預警系統，以及制度化的能力建構。

4. 芬蘭表示長久以來即協助太平洋小島國進行氣象援助及發展(Finnish-Pacific project, FINPAC)，氣象是推動永續發展的重要貢獻者。

三、巴黎氣候協議重點

巴黎 COP21 會議經過多方努力磋商，終於通過一份新的氣候協議，有 55 個締約國含括全球 55%的 GHG 排放量即可生效(由國立臺北大學自然資源

與環境管理研究所李堅明副教授兼所長所提供巴黎協定的重要條文與內容對照表如附錄五)。其重點包括：目標、減緩、調適、損害補償、能力建構、資金、技術發展移轉等 7 個部分，分述如下：

(一)目標部份：限制全球暖化在攝氏 2 度以內，並向攝氏 1.5 度努力。各國政府承諾儘快減少溫室氣體的排放，2050 年後人為排放的溫室氣體總量，應降到與森林及海洋吸納量相當的程度。

(二)減緩部份：每 5 年設定溫室氣體減排目標(NDC)。惟只有發達國家被期待提出絕對量的減排目標，發展中國家則是被「鼓勵」隨著應對能力的提升而設定減排目標，並可被容許依其經濟發達程度設定該等目標。要求各國盡快達到排放峰值，並每 4 年檢視其所設定的溫室氣體減排目標的執行情形。

(三)調適部份：要求各國遞交調適訊息通報，包含其國家調適優先順序與需求，計畫和行動，協助開發中國家強化因應氣候變遷的調適能力。

(四)損害補償部份：因應面臨海平面上升威脅小島嶼國家的需求，納入與氣候變化有關的災害「損失和損害」規定，加強各國氣候變遷衝擊災變之恢復能力。並以腳註說明，有關的損失及損害不涉及責任或賠償。

(五)能力建構部份：確立能力建構之合作機制，並協助開發中國家建立對抗氣候變遷之能力與技術。

(六)資金部份：在 2020 年前募齊 1000 億，作為加強現行發展中國家減緩與適應的政策、戰略、規章、行動計畫，並於 2025 年前將考慮到發展中國家的需要和優先事項的情況下，設定新的集資目標，再增加金額。

(七)技術發展移轉部分：建立已開發國家與開發中國家合作機制，加強投

資清潔能源。

通過巴黎氣候協議的歷史時刻(來源：UNFCCC-COP21 官網)

參、 會議觀察與心得

一、再生能源相關議題

(一)本屆會議中再生能源相關議題所佔的比例極高，可預見再生能源發展及減少石化燃料比例成為趨勢。國際能源組織(IEA)估計 60%的新能源需求將由分散式(微型及非格網)的解決方案來提供。

(二)無論太陽能、風能、水力能的利用，均與氣象條件如風力、日照、降雨、雲量等資料有極密切關係，目前國際採用歷史氣候資料進行相關電廠的設置評估相當普遍，但在運用即時氣象測報資料做電力格網平衡運轉的最佳化控管，則尚在起步階段。

(三)聯合國領導永續能源，倡議在 2030 年將尋求達到：(1)普遍的能源取用，(2)改善能源效率，(3)全球再生能源分享 3 個目標。

二、政府間氣候變化委員會(IPCC)相關議題

(一)IPCC 未來的報告內容將朝向提供區域尺度更多的分析和參考資訊，並且將加強對特訂議題的研究，以支援政策制訂者所需的決策資訊，此外，亦將強化所產製之的氣候變相關訊息對不同使用對象的溝通方法，以充分有效的將相訊息傳達給各不同層級使用者瞭解。

(二)IPCC 未來並將強化科學家與決策者的溝通與合作，以及對開發中國家之科學家的訓練與支援，並考慮納入：

1.對危險氣候變化的分析；

2.對各國 NDC 需求的支援；

3.減緩措施的效益與影響；

4.對決策者的支援等重要資訊。

三、海洋相關議題

(一)根據 IPCC AR5 報告，海洋為脆弱度高的生態系統之一，因受到多重環境壓力，暖化水域的珊瑚礁產生白化現象，北極夏季海冰系統遭受破壞，貝類與甲殼類漁業受海洋酸化影響而減少。2100 年後海平面上升的狀況可能對自然與人居環境造成極大的衝海洋正在改變，降低二氧化碳排放量則減緩海洋惡化的趨勢。

(二)積極將海洋相關文字納入巴黎協議，以及 IPCC 特別報告，以於未來能有持續的關注及依據。對於氣候變遷中海洋扮演角色的認知、觀測系統的強化、研究合作、科學理解、以及海洋與海岸相關的調適措施推展，預期將會有很大的助益。

(二)對海洋相關的理解、資源的開發與運用、以及因應氣候變遷之減量與調適的措施，尚有很大的發展空間，並有很高的國際交流與合作特性，值得持續關注與投入。

(三)11%的動物性蛋白來自海洋，需要健康的海洋生態系統，並保護海岸完整，以確保糧食安全與就業。

四、極地相關議題

(一)與會學者提出相當多的數據和證據顯示，極區海冰的減少非常可能是一種不可逆的過程，將導致地球更快速的增溫。因此，北極海冰的改變可視為是全球氣候變遷的快速警示系統。

(二)北極增溫將導致南北溫差縮小，極區噴流減弱，原呈現圓周運動之氣流的南北擺盪的振幅增加，使得冷空氣由極區外流，造成中高緯地區出現極端低溫現象的頻率增加。

(三)凍土溶解會大量釋出原儲於永凍層內二氧化碳(CO2)及甲烷(CH4)等溫室氣體，使溫室效應更加劇烈。因此凍土層的碳排放量需要被計入全

球排放的目標才合理。

五、巴黎氣候協議

巴黎氣候協議於 2015 年 12 月 12 日由 195 個國家通過，界定氣候變遷為一項危及人類社會及地球的急迫且可能無法逆轉的威脅，並提出對各國現行溫室氣體減量承諾可能無法滿足遏阻地球暖化事實的關切。在目標方面，限制全球平均溫度相較工業化前增加 2℃以下，並盡可能達到 1.5℃。至 2050 年全球溫室氣體必須達到淨排放為零。已開發國家肩負歷史排放責任，應採用具領先性的絕對減量目標，並被要求提供開發中國家減量支援；開發中國家則鼓勵加強減緩行動。2018 年(該協議生效後之前 2 年)，各國將盤點其減緩行動對於遏止全球暖化之貢獻，並於 2020 年調整修訂減緩計畫。一旦協議生效後，將自 2023 年起每 5 年進行一次總體審查，做為目標更新及加強行動承諾的依據。氣候基金則改為單獨不具約束力的決議參考條文(富國於 2020 年前每年提供 1 千億美元資金)，且至 2025 年前必須更新捐款金額。另外，該協議正式納入損失與損害機制。

巴黎協定被譽為第一個真正的全球氣候協議，富國和窮國都承諾致力抑制不斷增加的溫室氣體排放，並設定廣泛長期目標，要在本世紀達成淨零排放。形容巴黎協議「具雄心」的法國外交部長法畢斯說，這項協議將標誌著「歷史性轉捩點」，致力避免地球過熱帶來災難性後果。

肆、 建議與結語

一、發展氣象與再生能源的跨領域應用合作

世界氣象組織(WMO)已將能源議題列為全球氣候服務框架(GFCS)的第五項優先領域，各國氣象機關如日本氣象廳亦極力和各國共同發展再生能源合作計畫。我國亦需注意再生能源的運用分配比率，未來是否會成為貿易之間的條件之一。為及早因應，宜整合相關部會及資源，從內而外進行氣象與再生能源合作計畫，以避免未來在國際發展趨勢中被邊緣化。

二、透由協助南太平洋友邦小島國擴展國際交流與合作

小島發展國(SIDS)對於氣候變遷衝擊的脆弱度極高,聯合國極為重視,並訂定 103 年為小島國家發展年，氣象是永續發展的重要上游資訊來源，無論是世界氣象組織(WMO)或聯合國社經委員會(ECOSOC)皆強調氣象援助的重要性,特別是提供能力建構以及早期預警系統的發展。我國的氣象測報作業能力達國際水準，並有 6 個小島友邦位於南太平洋區域，可適當整合政府資源資源,協助友邦因應氣候變遷。氣象技術輸出，亦可做為我國在醫療及農業之外的第三條國際交流或援外管道,進而加強我國的國際參與,發揮國際影響力，預期此種交流與合作對自身的發展及邦交國均有助益。

三、強化臺灣沿海及近岸地區的氣候變遷衝擊評估與海氣象測報能力

聯合國政府間氣候變遷小組(IPCC)的報告指出，全球暖化有可能加強極端氣候事件對社會經濟的衝擊，其中以對人口密集的海岸區域和海島國家的影響最大。臺灣正位於上述對全球暖化衝擊最敏感地區，暴露於氣候變遷導致的諸多風險中，不僅極端氣候事件加劇，暴雨、波浪、暴潮、海水暖化及海平面上升，亦將危及臺灣地區的海岸及海域安全。英國風險顧問公司 Maplecroft 於其 2012 年的報告，將臺灣列入天災付出最大代價的

經濟體之一。為因應此一威脅，宜強化對臺灣沿海及近岸地區的衝擊評估與海氣象測報能力，蒐集彙整西北太平洋海域之海流、海溫、波浪、海水位高度與海面風等海洋環境監測與遙測資料，建置適應臺灣海域本土環境的災防海氣象監測系統和預報系統，產製並提供台灣海岸溢淹及海域防救災所需之高解析度波、流、潮等應用產品，以適當支援政府交通、漁業、水資源、防災、搜救等相關主管機關，進行氣候風險控管與調適作為，減輕災害的衝擊。

附錄一、此行所參與的週邊研討會議題

Side Events & Exhibits | COP 21/CMP 11

Legend:

Adaptation and related issues
Mitigation and related issues
Cross-cutting issues
Others

Scheduled	Time/room	Organizer	Title / theme / speakers
Friday, 04 Dec 2015	13:15—14:45 Observer rm 08 (150pax)	United Nations (UN) Mr. Amir H. Delju adelju@wmo.int	Science-based climate information- Building on evidence to implement policies Science and policy are intertwined to combat climate change. This side event will be a frank dialogue among scientific and policy-related stakeholders on the role of science in the climate change policy-making process.
Friday, 04 Dec 2015	15:00—16:30 Observer rm 02 (300pax)	Business Council for Sustainable Energy (BCSE) Ms. Laura Tierney ltierney@bcse.org Alliance to Save Energy (ASE) Ms. Laura Van Wie McGrory Lvanwie@ase.org Demand Response and Smart Grid Coalition (DRSG) Mr. dan delurey dan.delurey@wedgemere.com	A Key to Energizing Efficient, Productive & Smart Cities and Grids Business & policy leaders discuss how to unlock the door to emissions reductions and increased energy productivity with energy-efficient & smart technologies in our cities and electricity grids. Hear how these solutions will deliver low-carbon energy, climate resilience & improved productivity. Speakers: Leaders and clean energy executives from Alliance to Save Energy, Demand Response & Smart Grid Coalition, Business Council for Sustainable Energy and US Green Building Council.
Saturday, 05 Dec 2015	13:15—14:45 Observer rm 04 (200pax)	University of California (UCRP) Mr. Robert Monroe rmonroe@ucsd.edu Chile Sr. Julio Cordano jcordano@minrel.gov.cl	The Role of the Oceans Beyond 2020: Implications for Adaptation The ocean's changing role as carbon sink, deterioration of marine ecosystems, deoxygenation and acidification are worrying trends well documented by scientific research. We use the example of Easter Island to discuss the role oceans will play in the post-2020 climate order. Speakers: HSH Prince Albert II of Monaco; Lisa Levin, Scripps Oceanography; Libby Jewett, NOAA; Margaret Leinen, Scripps Oceanography; Hans Poertner, Alfred Wegeman Inst.
Monday, 07 Dec 2015	13:15—14:45 Observer rm 02 (300pax)	United Nations (UN) Ms. Kathryn Milliken kathryn.milliken@wfp.org	Food security under a changing climate This event explores the opportunities for climate finance and action to trigger large scale impacts on food security by building climate resilient livelihoods of farmers, fisher folks and rural communities threatened by climate change.

Monday, 07 Dec 2015	15:00—16:30 Observer rm 04 (200pax)	University of Oxford, Environmental Change Institute (ECI) Mr. Myles Allen anne.ryan@ouce.ox.ac.uk Green Economics Institute (GEI) Ms. Miriam Kennet greeneconomicsinstitute@yahoo.com Victoria University Wellington (VUW) Mr. Dave Frame david.frame@vuw.ac.nz	Metrics of progress towards net zero and the two degree goal: science for a safe climate This event will review how science can inform policy progress towards stabilizing climate, including comparing the impact of cumulative and short-lived climate pollutants and measuring progress of emission reductions towards meeting goals for limiting warming and other impacts in vulnerable regions. Speakers: The Hon. Tim Groser (Minister of Trade, & Minister for Climate Change, New Zealand, Confirmed), Jan Fuglestvedt (CICERO, Norway), Xolisa Ngwadla & Francois Engelbrecht (CSIR, South Africa), David Frame (Victoria U. Wellington, New Zealand), Myles Allen (U. Oxford, UK), Adrian Macey (VUW, Chair)
Monday, 07 Dec 2015	16:45—18:15 Observer rm 02 (300pax)	International Coastal and Ocean Organization (ICO) Ms. Miriam Balgos mbalgos@udel.edu South Africa Mr. ashley naidoo anaidoo@environment.gov.za World Ocean Network (WON) Ms. Iwona Gin secretariat@worldoceannetwork.org	The Importance of Addressing Oceans and Coasts in an Ambitious Agreement at the UNFCCC COP 21 Building on the Oceans Day at COP 21 outcomes, the event will address: implications of ocean warming, ocean acidification, & sea level rise; potential impacts on food security; conserving coastal ecosystems as carbon sinks; financing adaptation strategies; capacity development and public education. Speakers: I. Soesilo, Marine Affairs Minister, Indonesia; M. Mayekiso, Deputy DG Environment, South Africa; V. Ryabinin, Exec Secretary, IOC/UNESCO; A. Mathiesen, Asst DG Fisheries & Aquaculture, FAO; B. Cicin-Sain, President, Global Ocean Forum; H. Terashima, President, Ocean Policy Research Institute, Japan; P. Vallette, Vice President, World Ocean Network
Monday, 07 Dec 2015	18:30—20:00 Observer rm 01 (300pax)	United Nations (UN) Mr. Claudio Caponi ccaponi@wmo.int	The pivotal role of water in climate change adaptation and mitigation The event aims to raise awareness on the centrality of water for climate change adaptation and mitigation and the role the United Nations system can play in assisting countries in this regard. It will demonstrate good practices of how to adapt water management and water services to climate change.
Tuesday, 08 Dec 2015	11:30—13:00 Observer rm 01 (300pax)	Women Environmental Programme (WEP) Ms. Priscilla Mbarumun Achakpa priscilla.achakpa@wepnigeria.net Women in Europe for a Common Future (WECF) Mr. Miriam Reindl miriam.reindl@wecf.eu Women's Environment and Development Organization (WEDO) Ms. Bridget Burns bridget@wedo.org	Gender just climate solutions Women and men from around the world present their good practices and their roles in sustainable local economies and climate solutions. Concrete cook stove solutions and other household energy solutions, including best practice award and recommendations for the new agreement Speakers: Women Environmental Programme, Nigeria(WEP) Women in Europe for a Common Future (WECF) Women Environment and Development Organisation (WEDO) Government of Nigeria Climate and Clean Air Coalition TERRE Policy Centre India ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)
Tuesday, 08 Dec 2015	15:00—16:30 Observer rm 01 (300pax)	Women's Earth and Climate Caucus * (WECC) Ms. Wyolah Garden wgarden@ix.netcom.com	Global Women & Indigenous Peoples on the Frontline of Climate Solutions: Forests & Renewable Energy We will examine WECAN's Women's Climate Action Agenda, a climate justice blueprint for our path forward; present the Sarayaku people of Ecuador's "Living Forest" proposal,

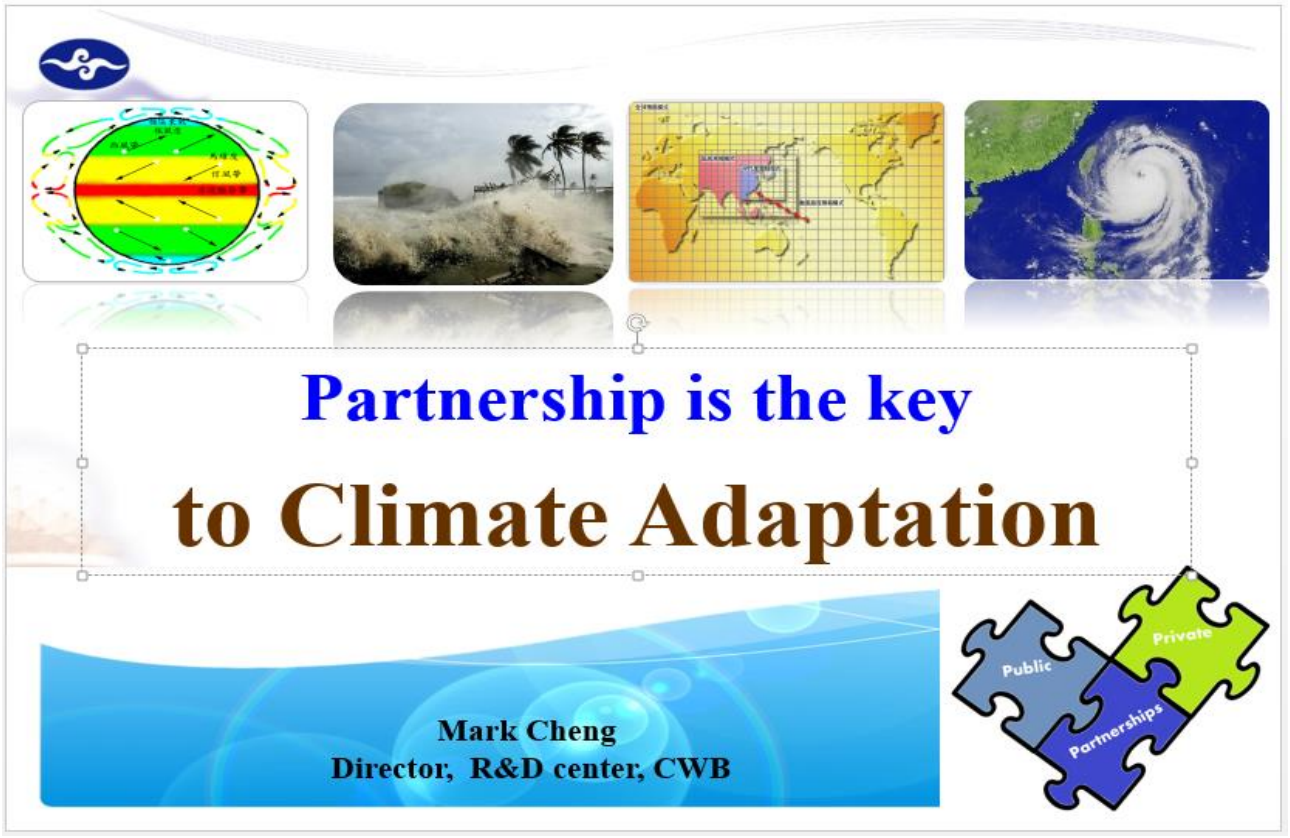
		Amazon Watch Mr. Andrew Miller andrew@amazonwatch.org Ithaca College Ms. Wyolah Garden wgarden@ix.netcom.com The Corner House Ms. Sarah Sexton enquiries@thecornerhouse.org.uk	highlighting Amazonian indigenous solutions; and showcase women as agents of change in transitioning to 100% renewable energy. Speakers: Osprey Orielle Lake, WECAN; Leila Salazar-López, Amazon Watch; Patricia Gualinga, Sarayaku; Angelina Galiteva, Renewables 100 Policy Institute; Neema Namadamu, WECAN-DRCongo; Casey Camp, Ponca Nation; Isis Alvarez, Global Forest Coalition; Nina Gualinga, Sarayaku; Felix Santi, President, Sarayaku
Tuesday, 08 Dec 2015	18:30—20:00 Observer rm 01 (300pax)	United Nations (UN) Ms. Marina Maiero maierom@who.int	Why the climate change agreement is critical to Public Health CC poses serious health risks, mostly for the poorest populations, but can also stimulate stronger health systems and health gains from the transition to a low-carbon economy. A robust international climate treaty is critical for public health. Focus areas: air pollution, biodiversity loss.
Wednesday, 09 Dec 2015	11:30—13:00 Observer rm 04 (200pax)	International Cryosphere Climate Initiative (ICCI) Ms. Pamela Pearson pam@iccinet.org Climate Policy Center (CPC) Ms. Pamela Pearson pampearson44@yahoo.com The Woods Hole Research Center (WHRC) Ms. Eunice Youmans eyoumans@whrc.org	Risks of Irreversible Climate Impacts from Cryosphere: Permanent Changes to the Earth System A new study, based on AR5 and later research defines the risk of permanent changes to Earth's climate system based on irreversible dynamics in the Arctic, Antarctica and alpine regions at different temperatures and CO2 levels: including sea-level rise, carbon release and polar ocean acidification. Speakers: Former KP Chair Adrian Macey (New Zealand), former IPCC Vice-chair Jean-Pascal van Ypersele, UNFCCC Science Advisor Joseph Alcamo, IPCC AR5 authors and other cryosphere scientists from Woods Hole, Max Planck Institute, and Potsdam Institute; invited indigenous peoples, ministers.
Wednesday, 09 Dec 2015	11:30—13:00 Observer rm 12 (300pax)	Potsdam Institute for Climate Impact Research (PIK) Mr. Christian Flachsland flachsland@pik-potsdam.de Stanford University Ms. Patricia Hines phines@stanford.edu	The IPCC at a Crossroads: Enhancing the Usefulness of IPCC to the UNFCCC Process The IPCC's past success in synthesizing large volumes of research and communicating the results to policymakers does not guarantee future success. We discuss problems and challenges that the IPCC faces and address two questions: Is the IPCC doing the right things? Is the IPCC doing things right? Speakers: Carlo Cararro, Ca' Foscari University of Venice and Fondazione Eni Enrico Mattei; Ottmar Edenhofer, Potsdam Institute for Climate Impact Research; Charles Kolstad, Stanford University; Robert Stavins, Harvard University; Hoesung Lee, Chair of the IPCC, Korea University
Wednesday, 09 Dec 2015	13:15—14:45 Observer rm 01 (300pax)	Harvard University Mr. Robert Stowe robert_stowe@harvard.edu Fondazione Centro Studi Enel * Mr. Mariano Morazzo mariano.morazzo@enelfoundation.org	Key Elements of the Paris Agreement and Implications for Business The Paris agreement will combine "bottom-up" features (the INDCs) with "top-down" elements (possibly an MRV regime). The agreement is actually a process; it will be elaborated and strengthened over time. What issues remain to be resolved, and what does such a "hybrid" agreement mean for business? Speakers: Gian Luca Galletti, Minister of Environment, Italy; Giandomenico Magliano, Ambassador of Italy to France; Joseph Aldy (Harvard University; by Skype); Simone Mori

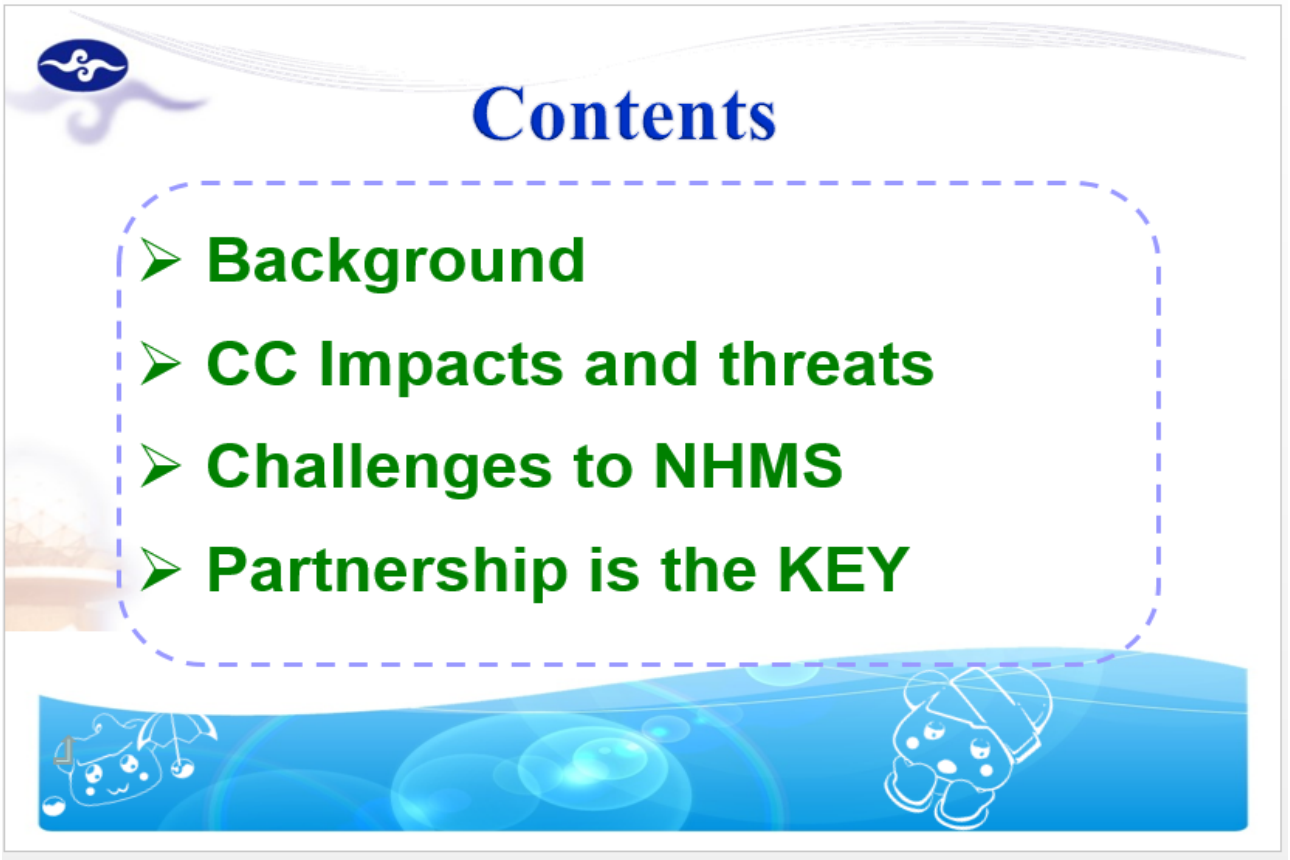
			(Enel Group); Robert Stavins (Harvard University); Jeffrey Swartz (IETA)
Wednesday, 09 Dec 2015	16:45—18:15 Observerrm 01 (300pax)	Secretariat of the Pacific Regional Environment Programme (SPREP) Ms. Nanette Woonton nanettew@sprep.org Samoa Mr. Suluimalo Amataga Penaia ausetalia.titimaea@mnre.gov.ws Vanuatu Mr. Salesa Nihmei salesan@sprep.org	Building a resilient Pacific through effective weather climate and early warning systems The Pacific islands are strengthening island resilience through a range of actions that use effective research and systematic observations for weather, climate & effective early warning systems to prepare communities for climate related disasters. We'll share our work to address climate change. Speakers: We will have high level speakers presenting from our Pacific islands including Samoa, host of the third SIDS Conference in 2014. We will also feature presenters from SPREP and the Government of Finland.
Wednesday, 09 Dec 2015	18:30—20:00 Observerrm 03 (200pax)	Monaco Mr. Patrick Rampal rampal@chpg.mc Health and Environment Alliance (HEAL) Ms. Anne Stauffer anne@env-health.org	Health central to Climate Change action Organized by the Scientific Centre of Monaco, The WHO Regional Office for Europe, and the Health & Environment Alliance. The scope of this side event is, to highlight, that strong and effective action to limit climate change is needed to avoid unacceptable risks to global health. Speakers: HSH Prince Albert II of Monaco ;Mrs Marisol Touraine ;Dr Zsuzsanna Jakab ;Sir David King ;Dr Bettina Menne ;Ms Rita Schwarzelühr-Sutter ;Dr Gina Radford ; Prof Jacqueline McGlade ;Ms Stana Božović ;Dr Christian Friis Bach ;Mr Michel Jarraud ;Mr Hans Bruyninckx ;Prof Patrick Rampal ;Ms. Genon Jensen
Thursday, 10 Dec 2015	13:15—14:45 Observerrm 08 (150pax)	Tajikistan Ms. Alessia Vita alessia.vita@fao.org Asociación Civil Oikos (OIKOS) Mr. Eric Chavez echavez@oikos.pe	Adapting to climate change - success stores and challenges from across mountain ranges How is climate change affecting mountain ecosystems and livelihoods in Central Asia and in the Andes? In the framework of the Mountain Partnership, the government of Tajikistan and OIKOSD encourage dialogue on how mountain communities are adapting to climate change. Speakers: Members of the Tajik Government, OIKOS representatives, Mountain Partnership Secretariat, Members of the Mountain Partnership, civil society, scientific community
Thursday, 10 Dec 2015	16:45—18:15 Observerrm 12 (300pax)	Helvetas Swiss Intercooperation Ms. Rupa Mukerji ecc@helvetas.org Liechtenstein Mr. Sven Braden sven.braden@llv.li Welthungerhilfe Mr. Michael Kuehn michael.kuehn@welthungerhilfe.de	Ensuring food security in a changing climate through sustainable agriculture production Research and practical experience on the impacts of CC on food security. To underline the need for adaptation and see what forms need to be taken, HELVETAS and IIED presents examples from Mali, and other countries. Welthungerhilfe presents a study on the 4 columns of FS in Kenya, Pakistan and Peru. Speakers: Minister Marlies Amann-Marxer, Liechtenstein – Souleymane Cisse, Ministry of Environment, Mali - Célestin Dembélé, Deputy Director, HELVETAS - Panagiotis Potolidis-Beck, First Secretary, Liechtenstein - Rupa Mukerji, Lead Author IPCC, HELVETAS - Jasmin Koottummel, Welthungerhilfe - Hans Rudolf Herren

Friday, 11 Dec 2015	13:15—14:45 Observer rm 04 (200pax)	Lesotho Mr. giorgio grussu giorgio.grussu@fao.org Colorado State University Ms. Gillian Bowser gbowser@colostate.edu Mountain Institute, Inc. (TMI) Mr. Andrew Taber ataber@mountain.org	Adapting and building resilience to climate change in mountain communities How can the Mountain Partnership bolster resilience to climate change in mountain regions? The Government of Lesotho, The Mountain Institute, Colorado State University and partners will focus on the nexus of food security, water and gender considering national policies and local solutions Speakers: Government of Lesotho, The Mountain Istitute, Colorado State University, Mountain Partnership Secretariat

*Provisionally admitted observer organization

附錄二、參與國際氣候發展智庫(ICDI)週邊會議所提出的簡報

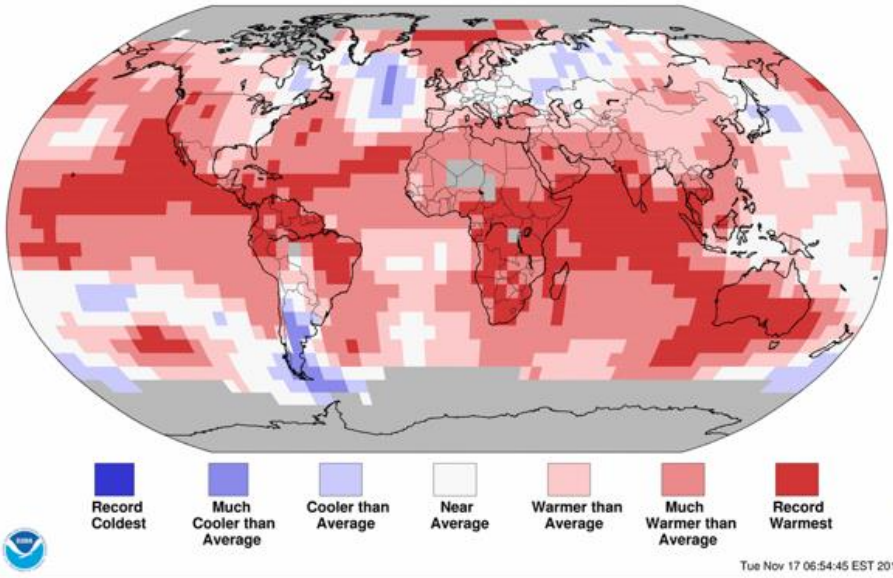




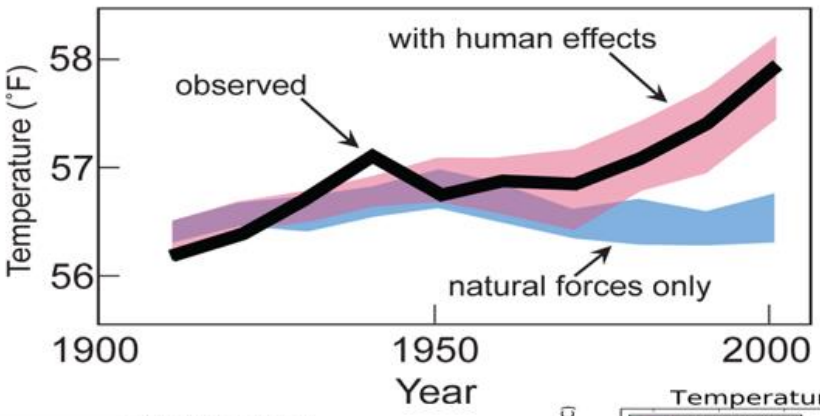
NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Global Summary Information - October 2015

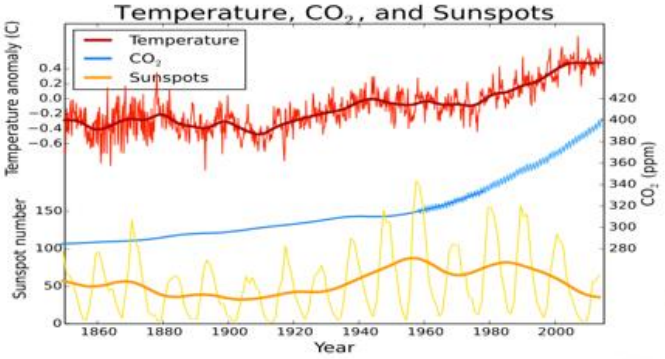
- October 2015 was warmest on record for the globe and greatest above-average departure from average for any month
- Year-to-date also continues to be record warm



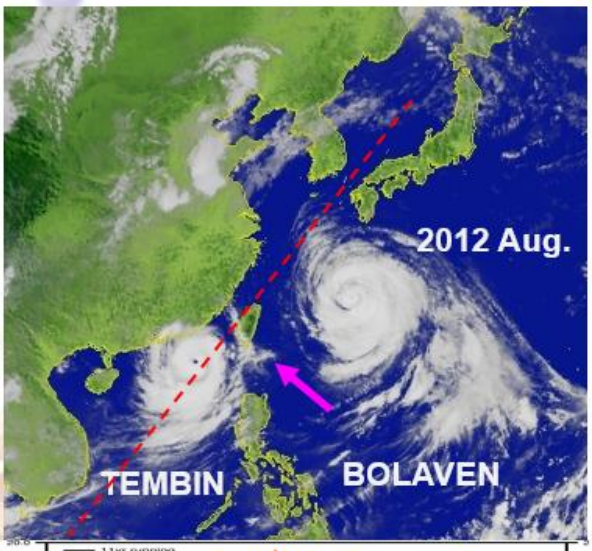
NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



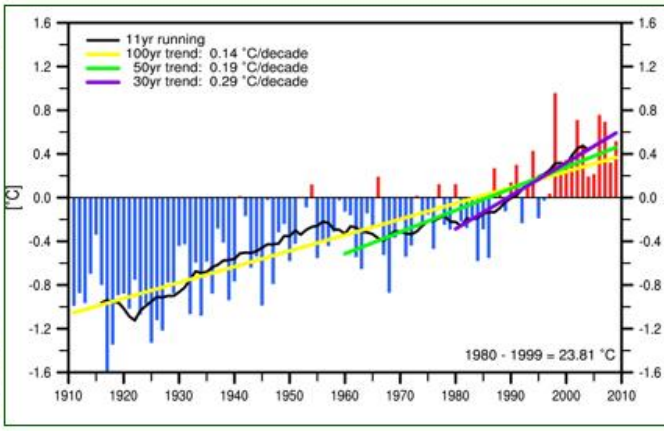
Observations
Only Natural Forces
Both Natural & Human Forces

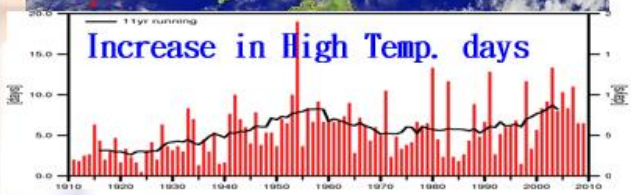


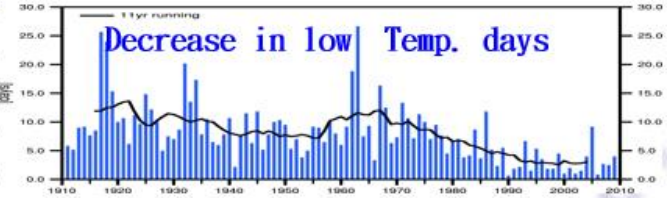
Taiwan Climate Change records



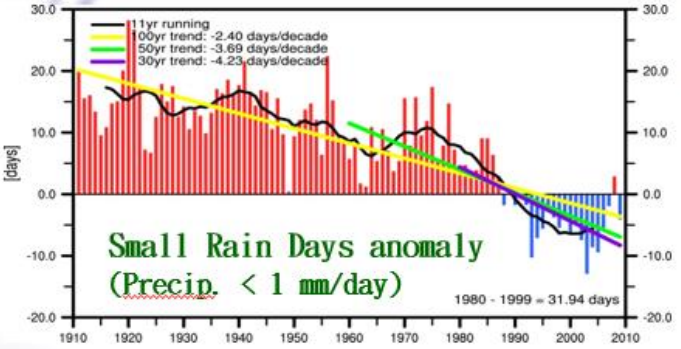
Temperature Trend (1911~2010)

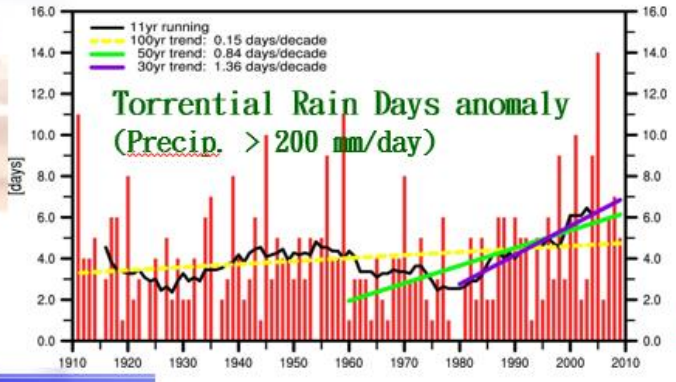


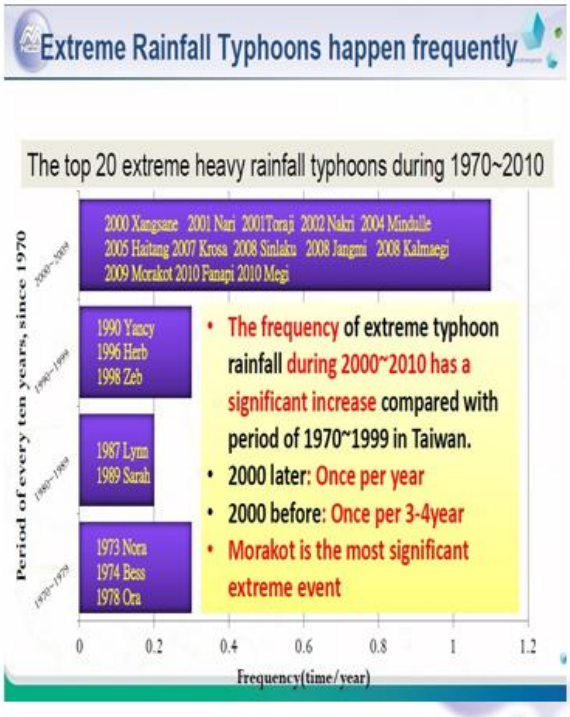




Increase in Heavy Precip. days
Decrease in Light Precip. days — more intense rain fall

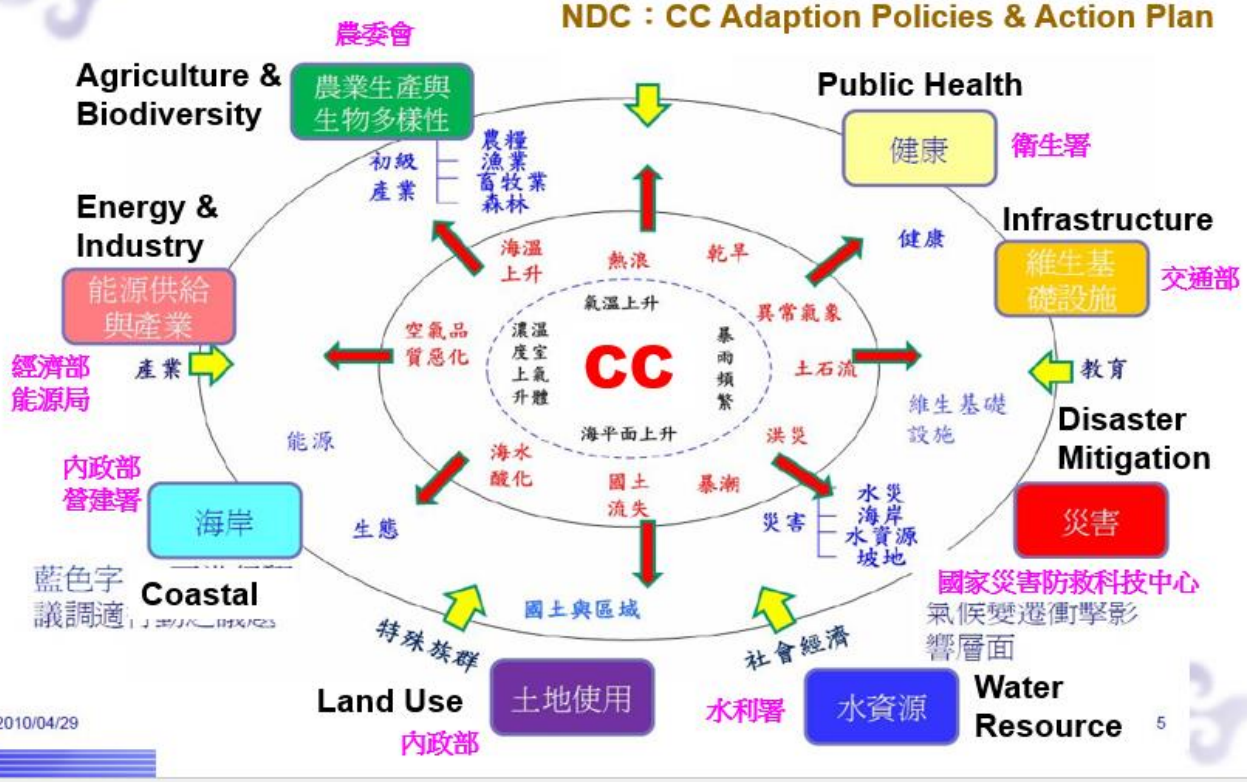






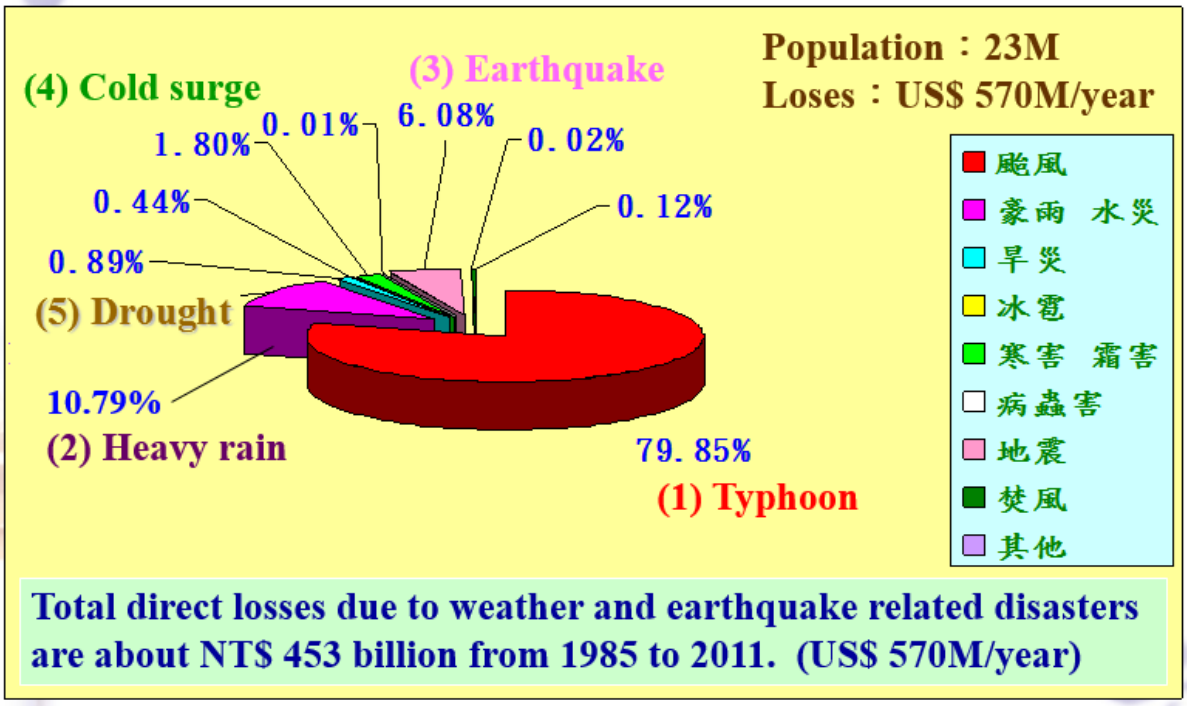
Climate Change Impact Sectors

NDC：CC Adaption Policies & Action Plan



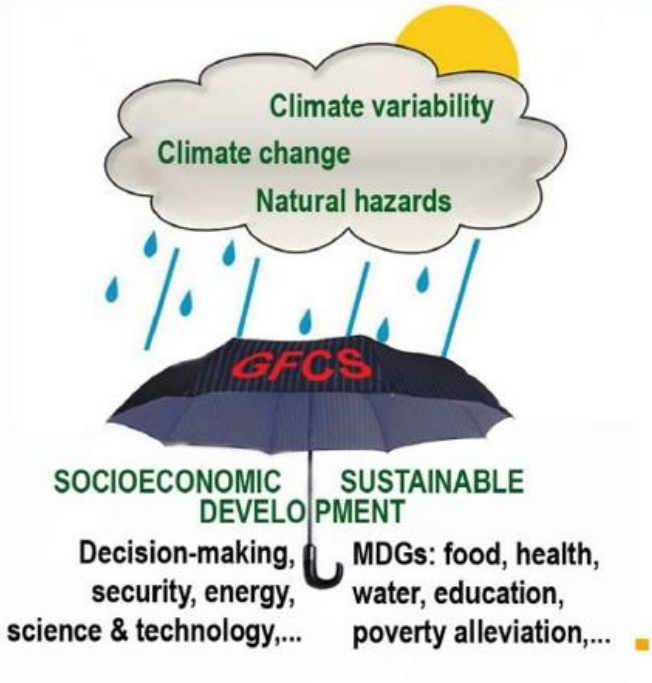
2010/04/29 5

Natural Disaster Losses



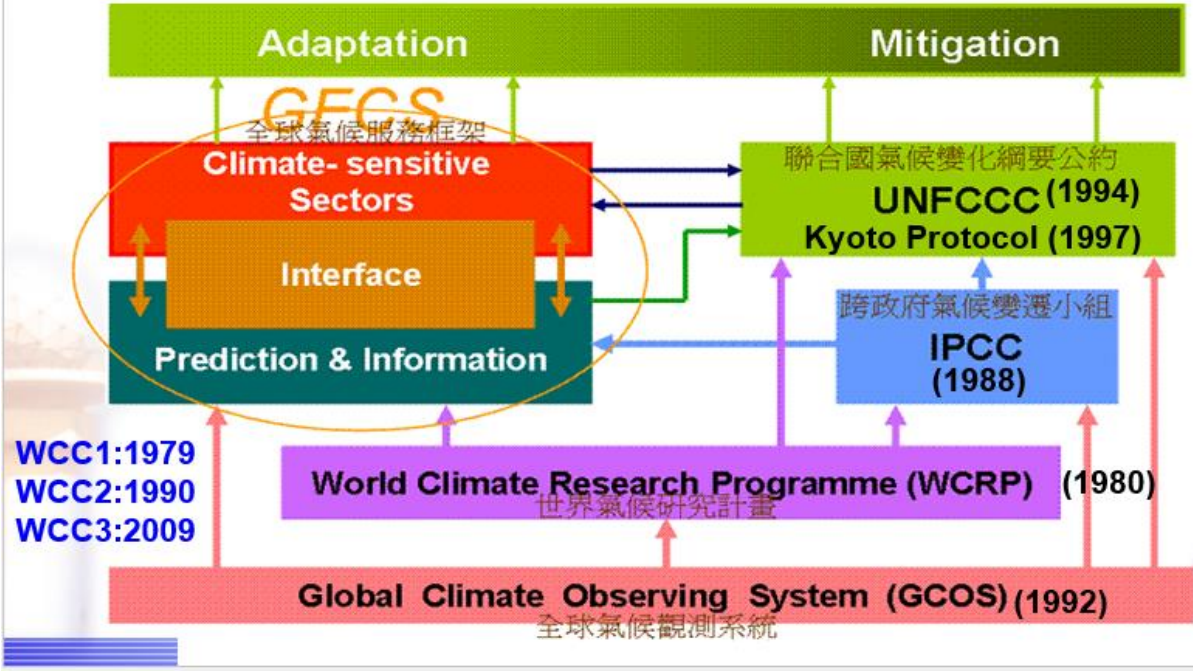
Common Challenges that NHMS Faced

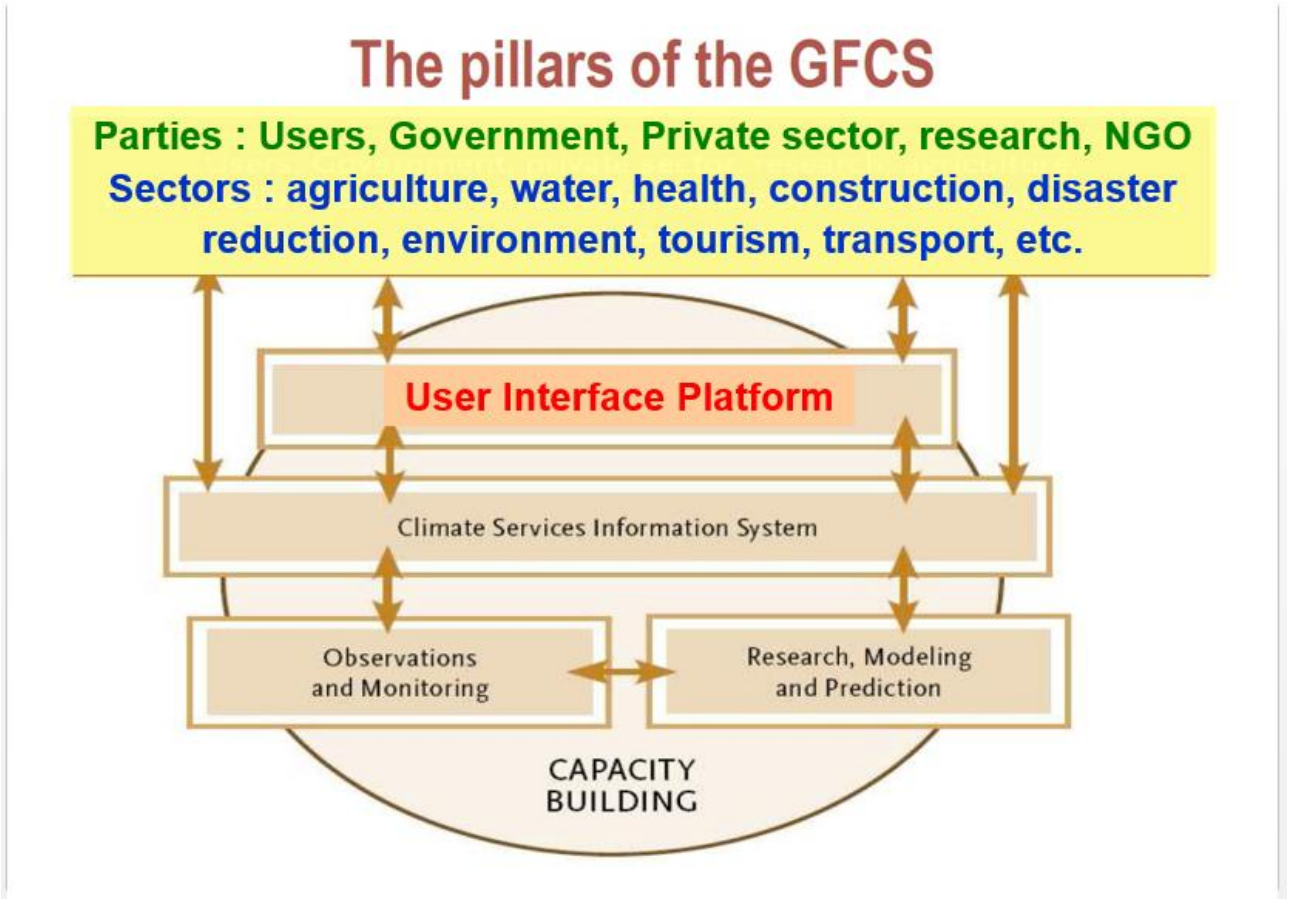
- ✓ Past no longer a good indicator for the future
- ✓ Need for closer partnership between physical scientists and economists
- ✓ Development of new instruments (e.g weather/climate derivatives)
- ✓ Decision making in the context of uncertainty
- ✓ Need for multidisciplinary partnerships

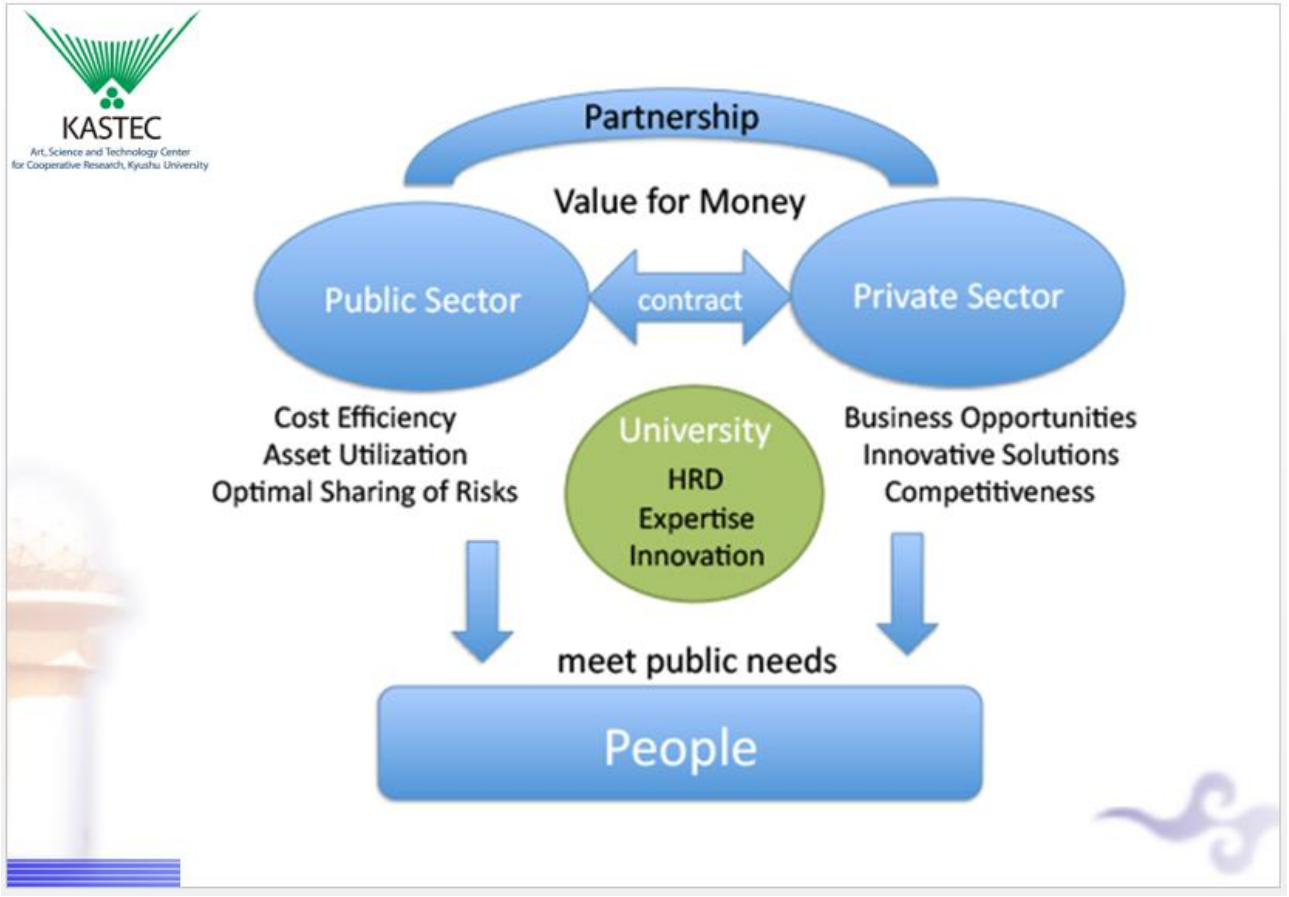


World Meteorological Organization (WMO) initiated

Global Framework for Climate Services (GFCS) in 2011 to Call for closer Partnership Among stake Holders for Climate Change Adaptation, Disaster Risk Reduction, …




The pillars of the GFCS
Parties : Users, Government, Private sector, research, NGO
Sectors : agriculture, water, health, construction, disaster reduction, environment, tourism, transport, etc.
User Interface Platform
Climate Services Information System
Observations and Monitoring
Research, Modeling and Prediction
CAPACITY BUILDING


KASTEC
Art, Science and Technology Center for Cooperative Research, Kyushu University
Partnership
Value for Money
Public Sector
contract
Private Sector
Cost Efficiency
Asset Utilization
Optimal Sharing of Risks
University
HRD
Expertise
Innovation
Business Opportunities
Innovative Solutions
Competitiveness
meet public needs
People

IFC International Finance Corporation WORLD BANK GROUP

Public-Private Partnership can help to:

1. Improve access to basic services

- Accelerated construction
- On-time and on-budget delivery
- Share risk to private sector
- Regular maintenance and upgrades

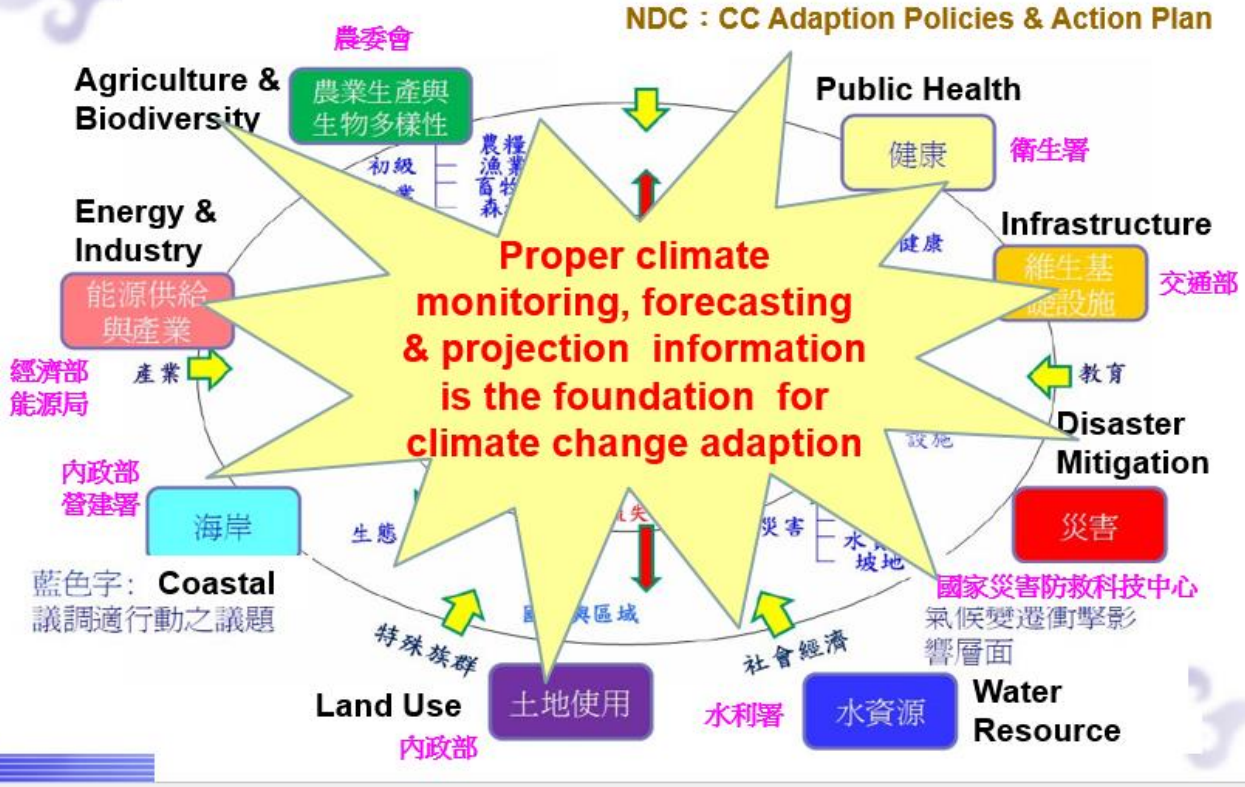
2. Increase quality and efficiency

- Higher quality service standards
- Better identification and allocation of risks
- Increased efficiency of facilities and services
- Access to best practices and private expertise

3. Mobilize capital

- Access to new private financing
- Better budgetary efficiency
- Value for money

National CC Adaption Policies & Actions

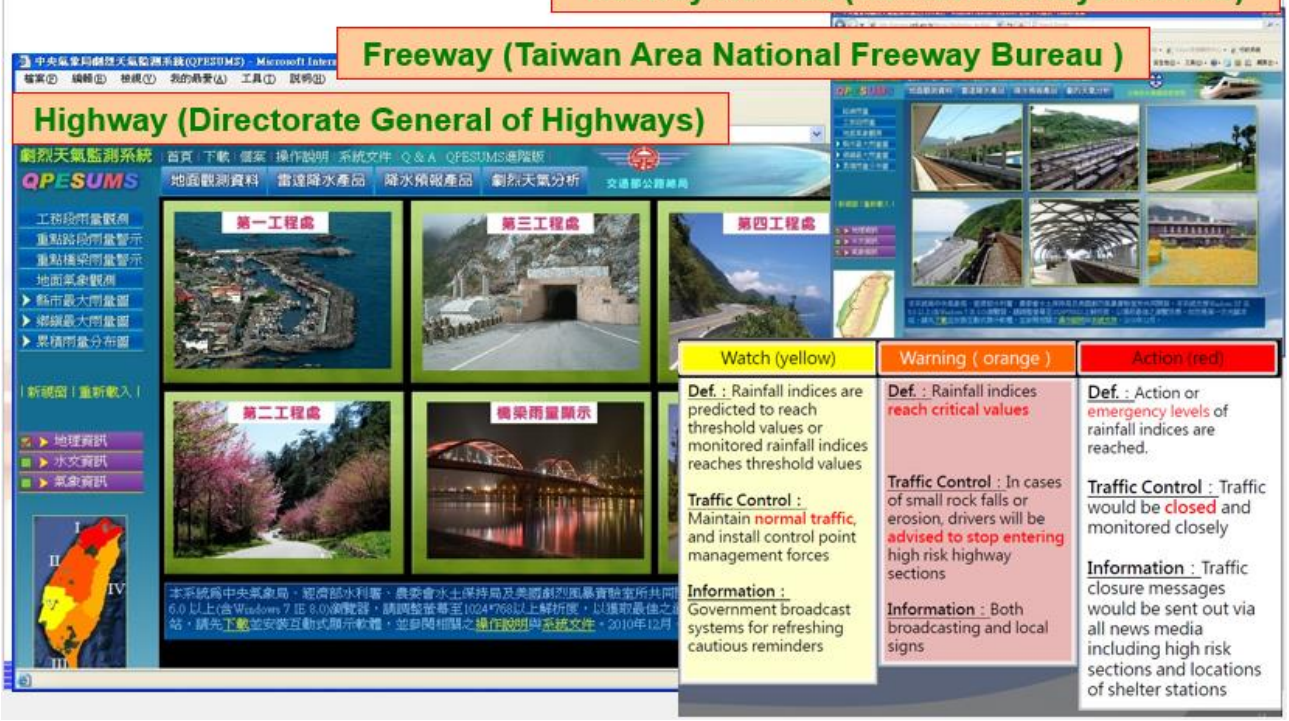


Using QPE/QPF for Early Warning of Road Collapse under heavy rainfall event

Railway Rainfall (Taiwan Railways Bureau)

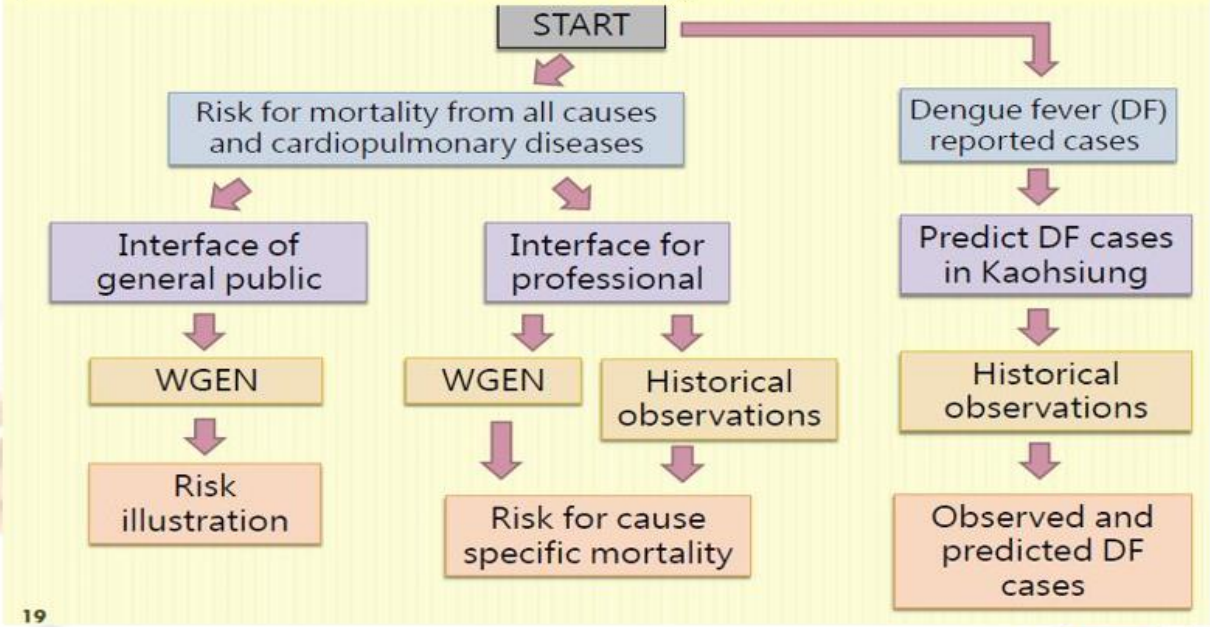
Freeway (Taiwan Area National Freeway Bureau)

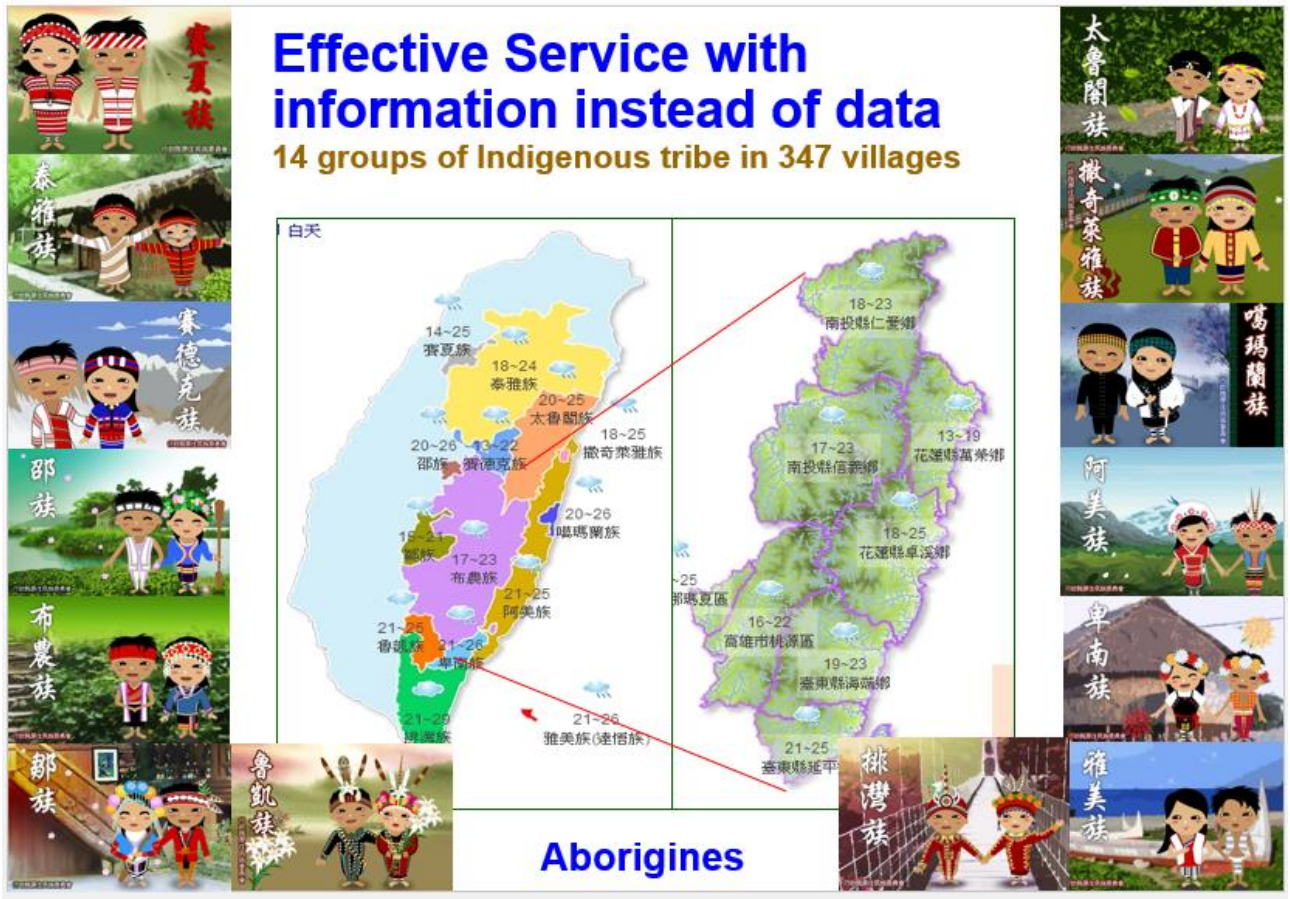
Highway (Directorate General of Highways)



Watch (yellow)	Warning (orange)	Action (red)
Def. : Rainfall indices are predicted to reach threshold values or monitored rainfall indices reaches threshold values Traffic Control : Maintain normal traffic, and install control point management forces Information : Government broadcast systems for refreshing cautious reminders	Def. : Rainfall indices reach critical values Traffic Control : In cases of small rock falls or erosion, drivers will be advised to stop entering high risk highway sections Information : Both broadcasting and local signs	Def. : Action or emergency levels of rainfall indices are reached. Traffic Control : Traffic would be closed and monitored closely Information : Traffic closure messages would be sent out via all news media including high risk sections and locations of shelter stations

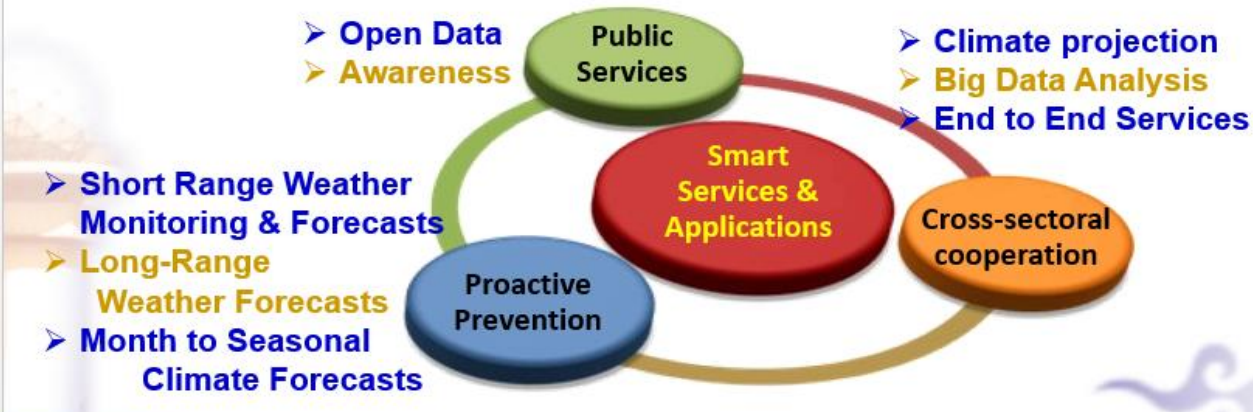
Application of short-term climate outlook on public health in Kaohsiung, Taiwan





Future Directions

- From Seamless Forecasts to Seamless Services
- Support Cross-Sectoral Risk Management, Climate Adaptation and Economical Applications
- Collaborate with all possible partners locally and globally

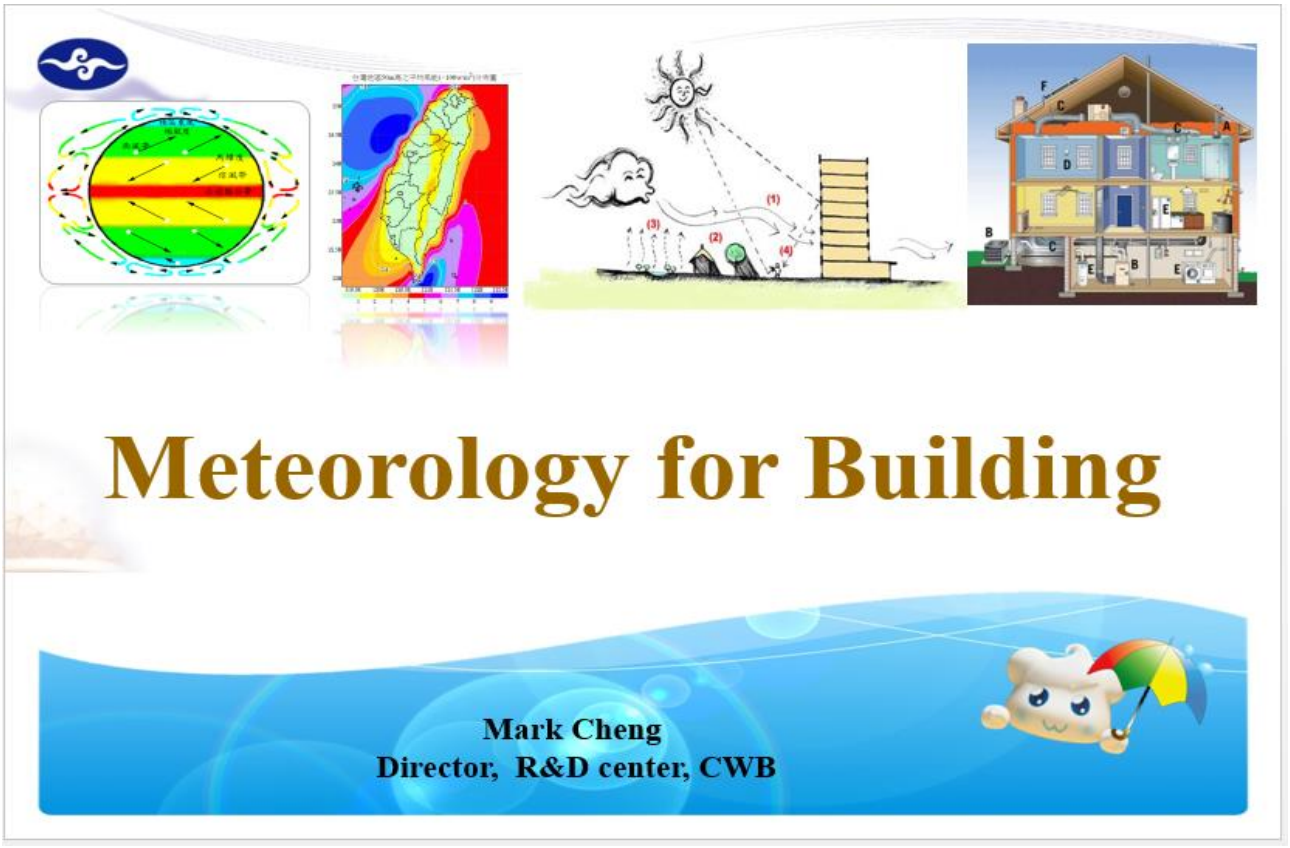


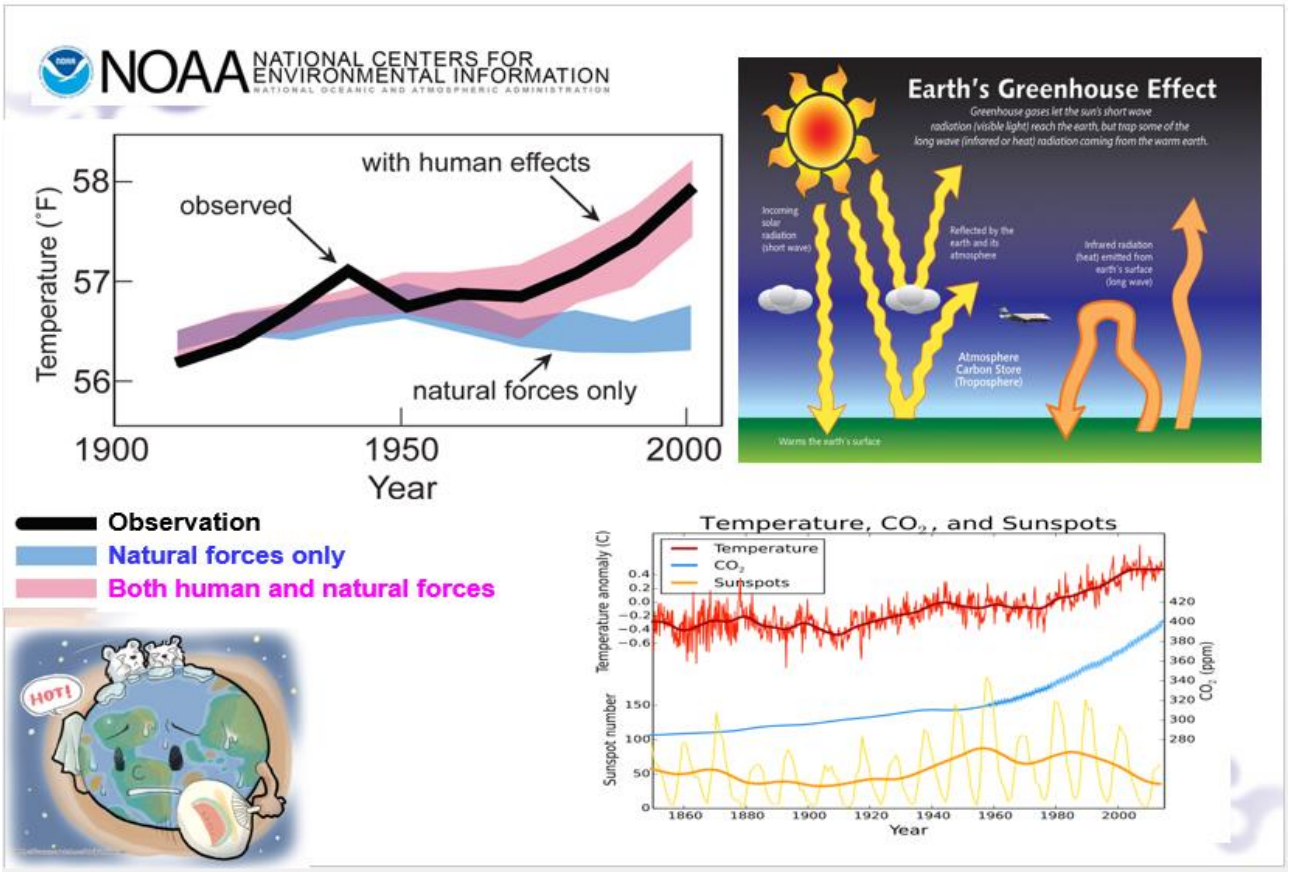
Provide science based Climate Service information to government and society for safer and better world

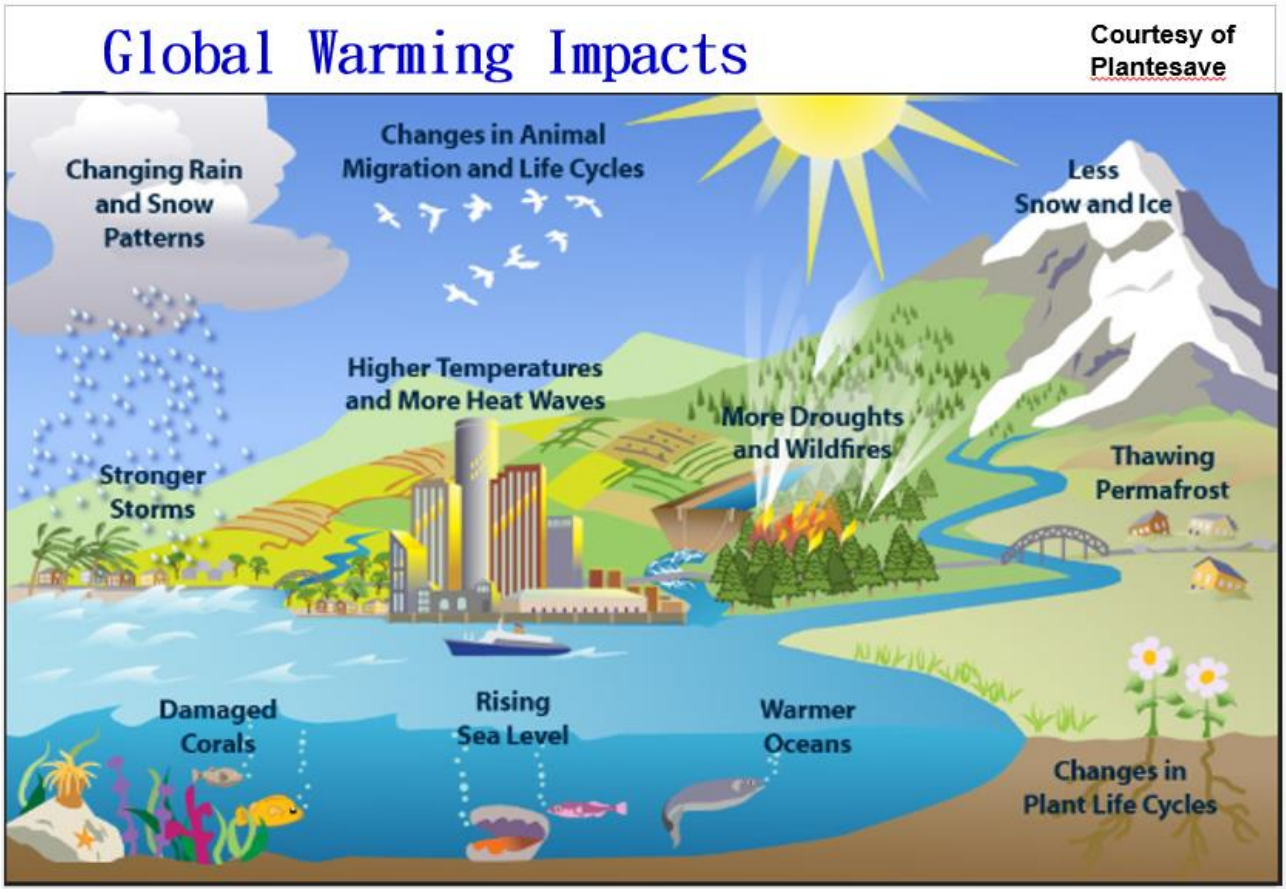
Thanks for your Attention

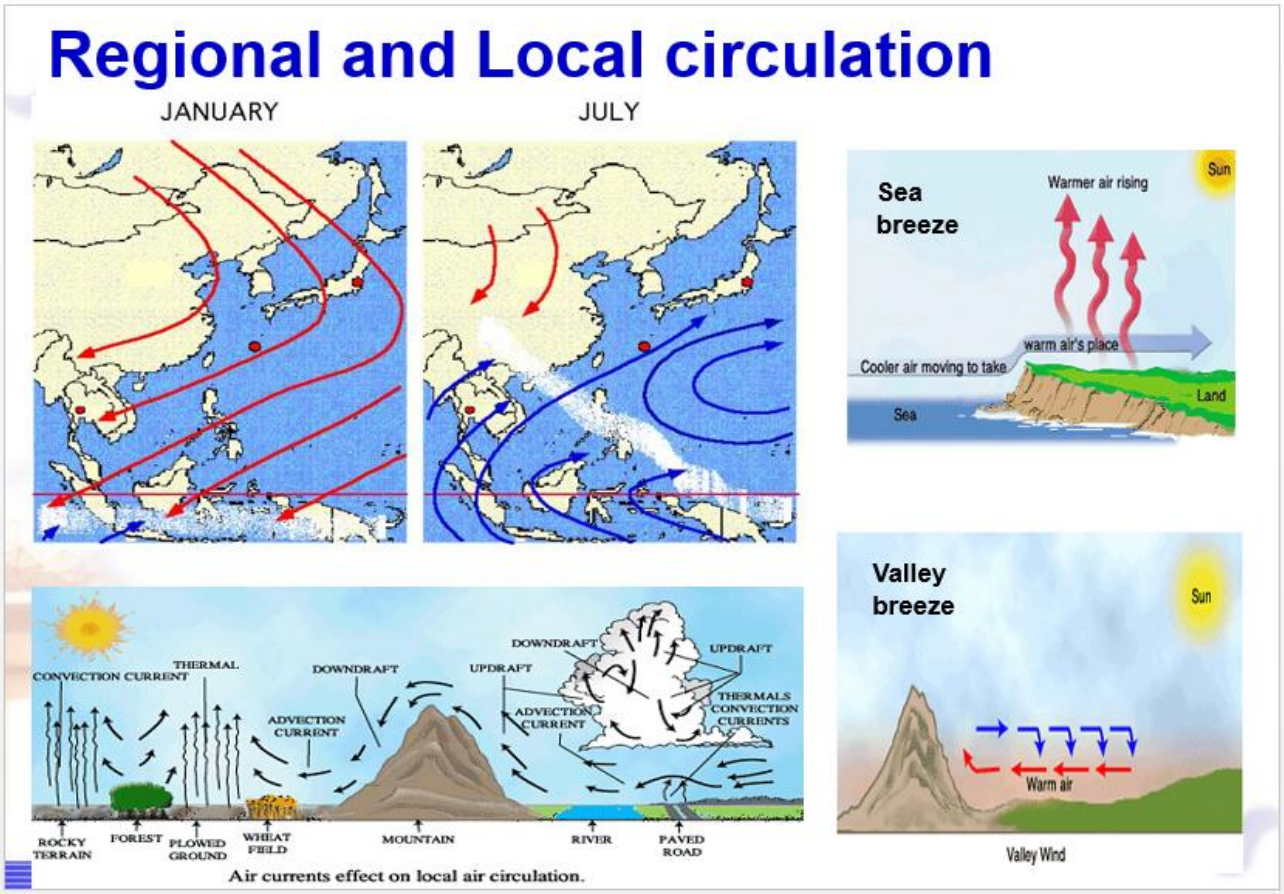
Questions ? Comments ? Suggestions ?

附錄三、參與台達電基金會(DEF)週邊會議所提出的簡報

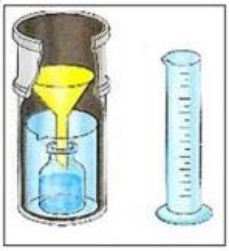





Global Warming Impacts
Courtesy of Plantesave
Changing Rain and Snow Patterns
Changes in Animal Migration and Life Cycles
Less Snow and Ice
Higher Temperatures and More Heat Waves
More Droughts and Wildfires
Thawing Permafrost
Stronger Storms
Damaged Corals
Rising Sea Level
Warmer Oceans
Changes in Plant Life Cycles


Regional and Local circulation
JANUARY
JULY
Sea breeze
Sun
Warmer air rising
warm air's place
Cooler air moving to take
Land
Sea
Valley breeze
Sun
Warm air
Valley Wind
CONVECTION CURRENT
THERMAL
DOWNDRAFT
UPDRAFT
ADVECTION CURRENT
DOWNDRAFT
UPDRAFT
THERMALS CONVECTION CURRENTS
ADVECTION CURRENT
ROCKY TERRAIN
FOREST
PLOWED GROUND
WHEAT FIELD
MOUNTAIN
RIVER
PAVED ROAD
Air currents effect on local air circulation.

Meteorological Parameters
Affect our daily life



Temperature

Humidity

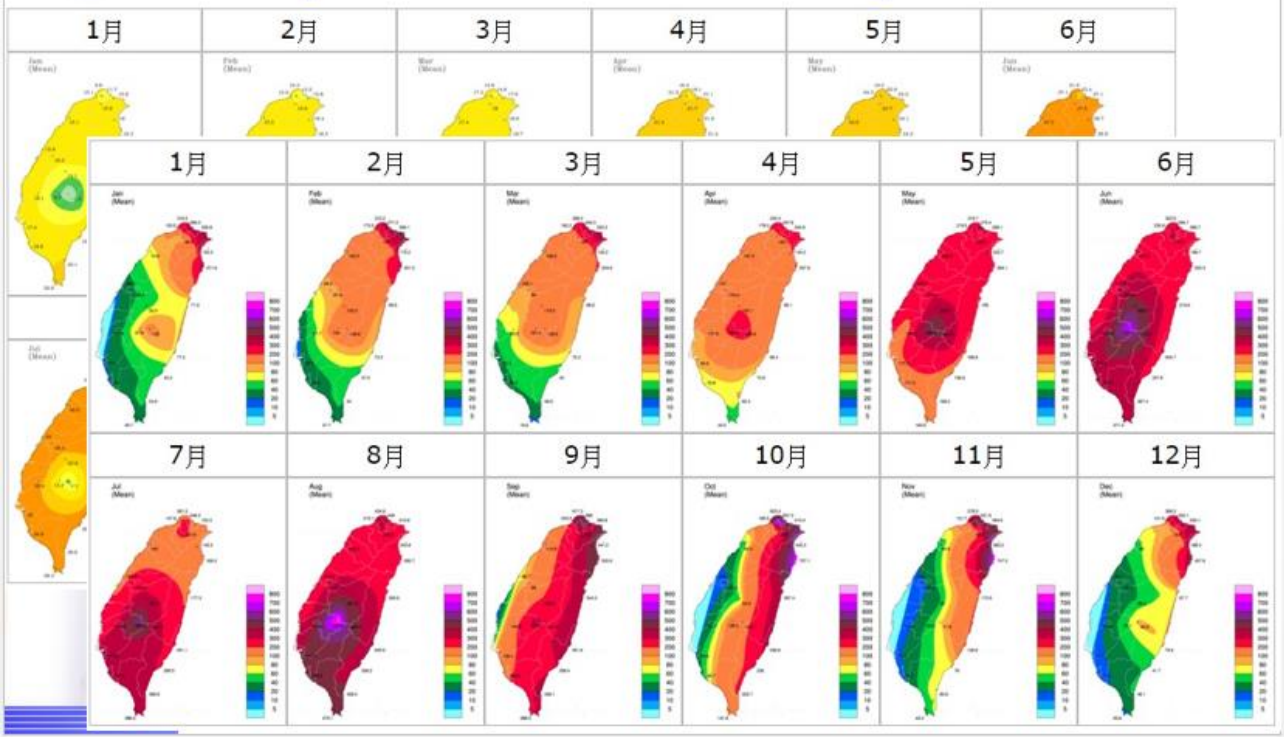
Precipitation

Wind

Solar Radiation

Cloud(Sky)

Climate mean of Temperature and Precipitation



Climate Division for Building Energy Saving
Solar Radiation and Wind Power

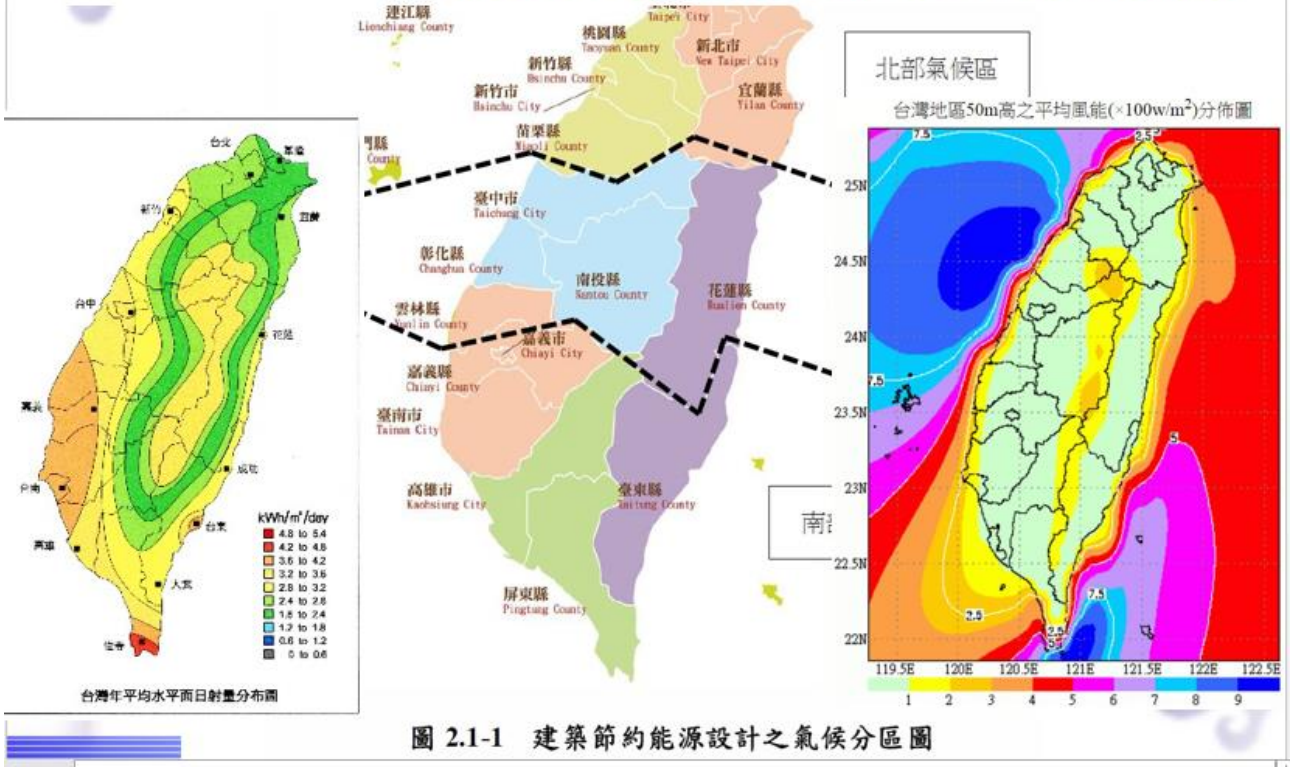
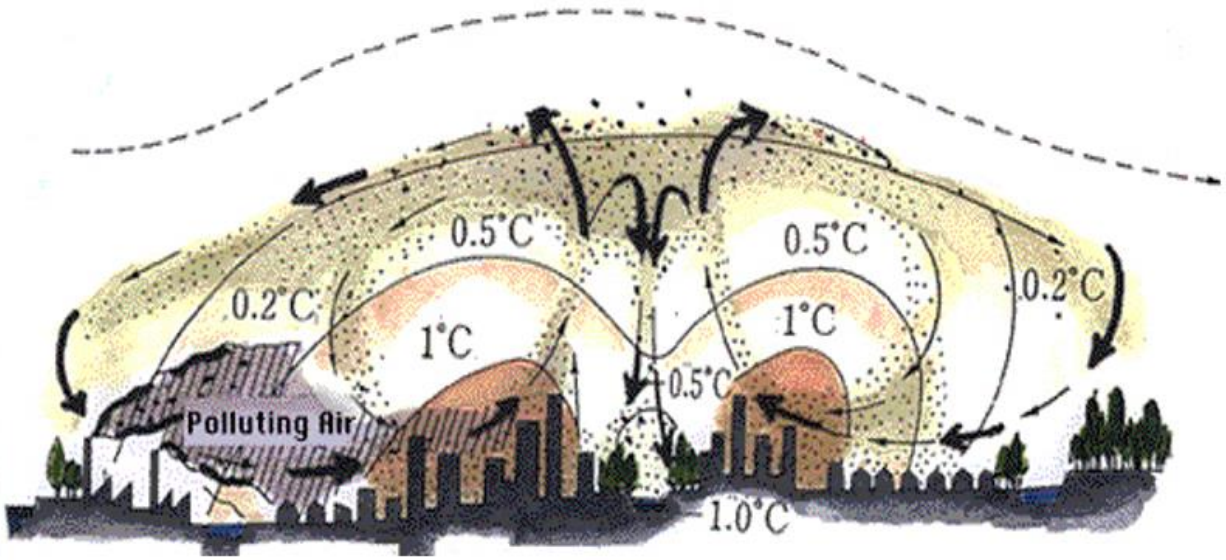


圖 2.1-1 建築節約能源設計之氣候分區圖

Urban Heat Island effect

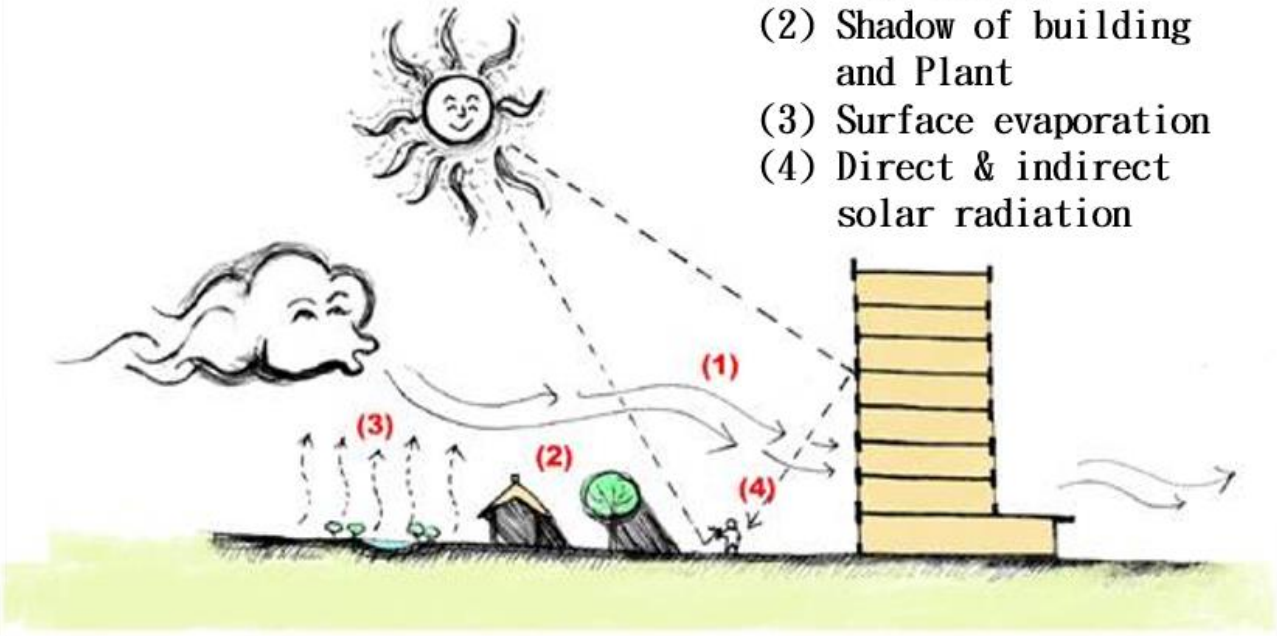


Factories Residential Down Town Park Green Zoon

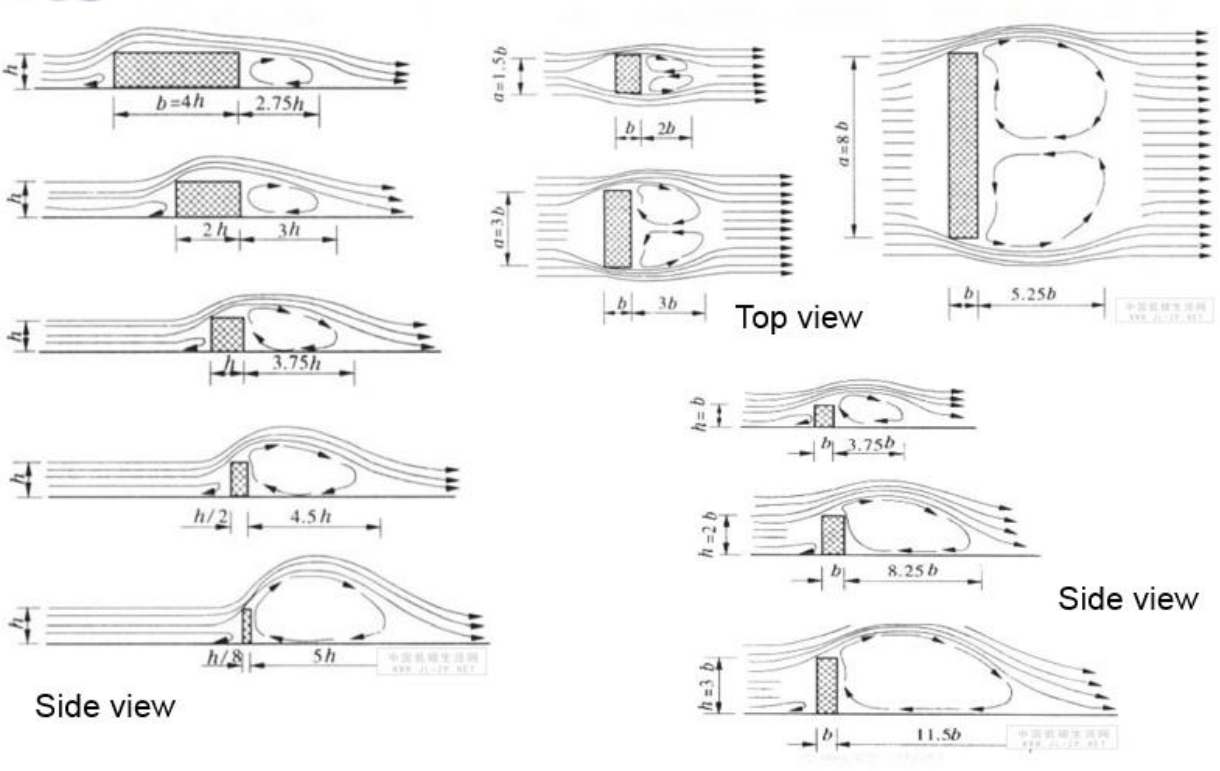
臺北市都市熱島效應改善計畫
創造節能減碳的永續都市居住環境

Building micro Meteorology (Temperature)

(1) Wind effect
(2) Shadow of building and Plant
(3) Surface evaporation
(4) Direct & indirect solar radiation



Building micro Meteorology (wind flow)



Building Energy Saving Technical Menu

(Taiwan Green Productivity Foundation)

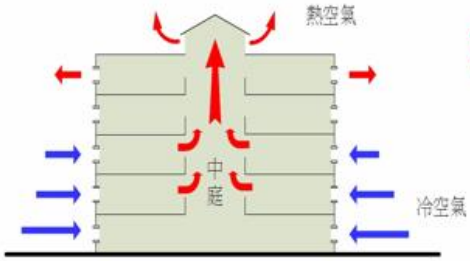


圖 4-2 熱浮力通風示意圖

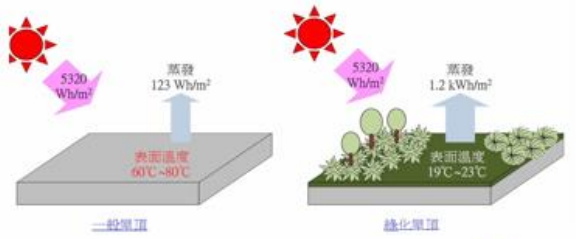


圖 3.3-3 綠化屋頂與一般屋頂的外表面

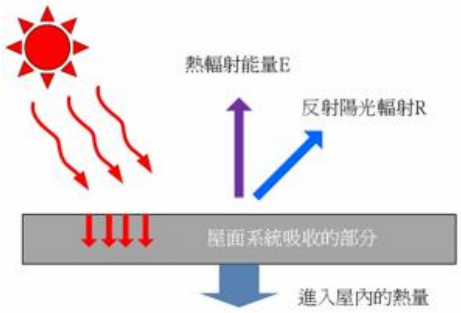


圖 3.4-4 屋面的陽光反射和熱傳導

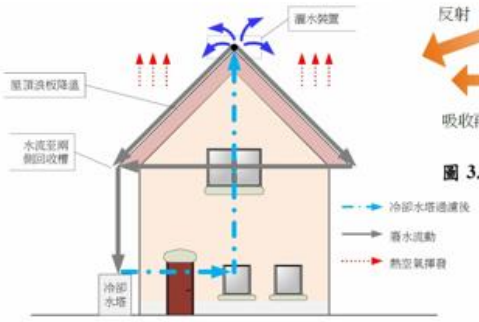


圖 3.5-4 屋頂灑水系統

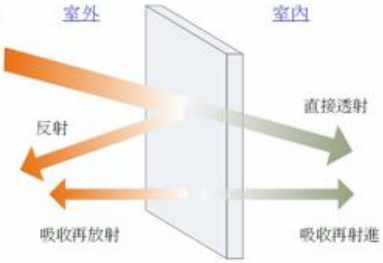


圖 3.8-1 色板玻璃陽光照射示意圖

Wind power generator tree in COP21 venue

UN HABITAT
FOR A BETTER URBAN FUTURE

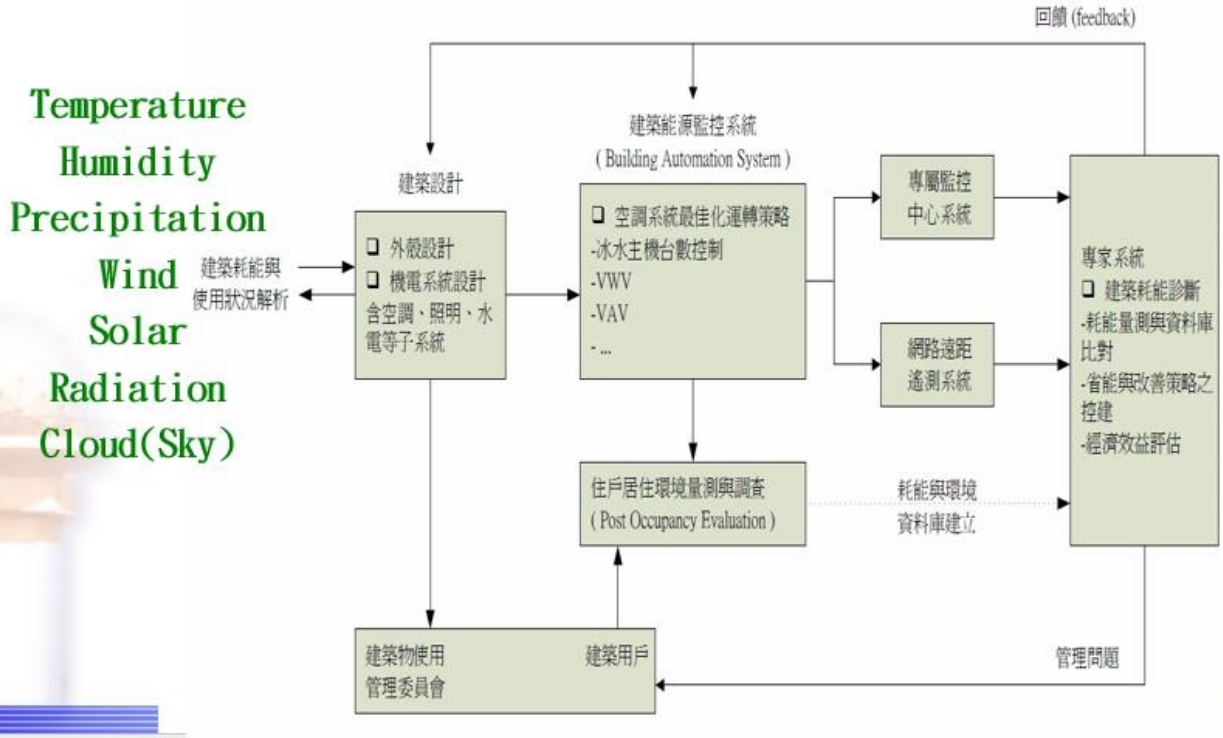
Energy Saving Building

(1) Orientation
(2) Plant
(3) Permeable area
(4) Ventilation
(5) Natual Lighting
(6) Overhang Shading
(7) Local materials
(8) Solar Water Heaters
(9) Solar Home Systems
(10)Waste Water re-use
(11)Eain Collection

Green Building (New Taipei City / Environment Protection Bureau)

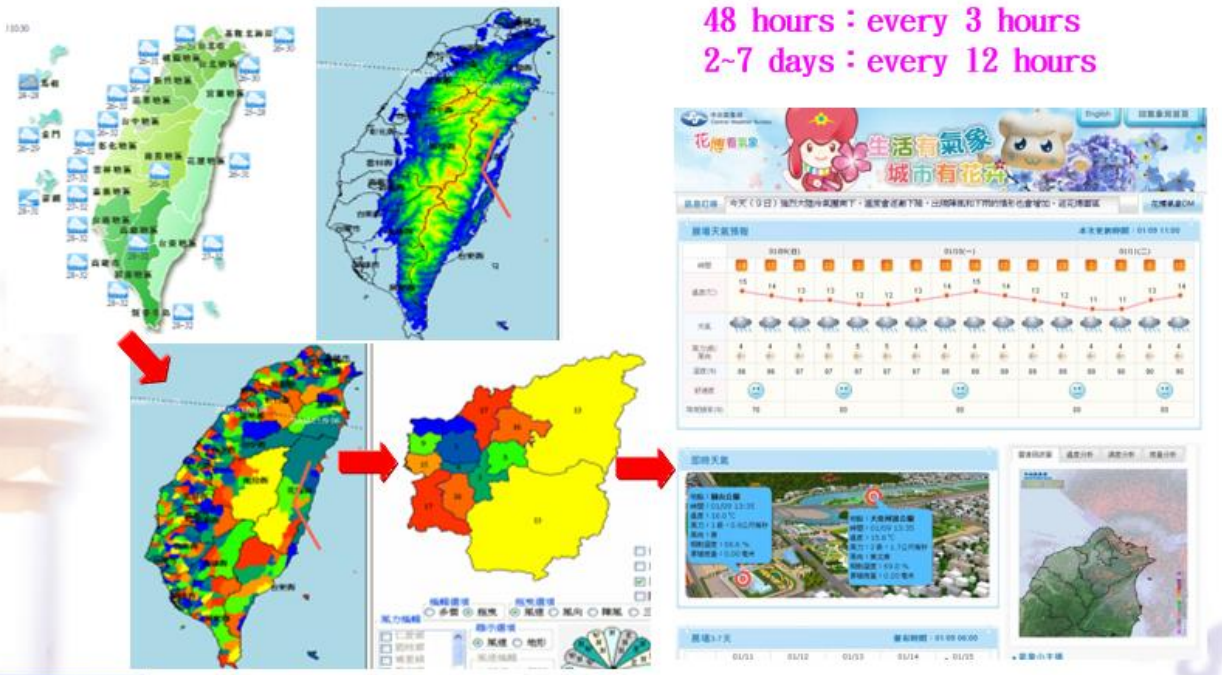
Building Energy Management System

(Building Energy Saving Technical Menu -Taiwan Green Productivity Foundation)



368 Township Forecast (2012)

Town / Indigenous / National Park / Resort / Recreational Farm / Reservoir / Harbor



Provide science based Climate Service information to government and society for safer and better world

Thanks for your Attention

Questions ? Comments ? Suggestions ?

附錄四、世界氣象組織在 COP21 會議發布的訊息(摘錄)

Key messages from the WMO community to COP 21

The world is looking to the international community to deliver a new, ambitious and universally binding agreement at COP 21 in Paris. It is of prime importance that Members take into account their National Meteorological and Hydrological Services (NMHSs) responsibilities and capabilities as they participate actively in the negotiations to ensure that the climate agreement and other outcomes strengthen the role of NMHSs and their ability to provide services to their communities.

Negotiations have already made important references to subjects that are highly relevant to the WMO community. These include:

- *The use of the best available scientific knowledge for climate action;*
- *Strengthening and improving climate-related research and systematic observation; and*
- *Assessment of knowledge gaps in adaptation.*

It would thus be important that the final text adopted in Paris preserved such language that highlights the role of scientific information derived from research and systematic observations to support decision-making.

WMO and its Members' NMHS contributions to areas of particular relevance to the Convention are briefly outlined below in the form of a short statement and supportive information.

Mitigation

The monitoring of mitigation actions will benefit from enhanced observation of atmospheric concentrations of greenhouse gases, which must be sustained and even strengthened, at the same time climate services that support the energy sector can play a vital role in reaching a climate neutral economy.

The WMO Global Atmosphere Watch Programme (GAW) is unique in providing reliable long-term, high-quality observations of global atmospheric composition changes in support of international policymaking, as documented in the annual Greenhouse Gas Bulletin. Per a decision of the *Seventeenth* World Meteorological Congress, GAW has embarked on the development of an Integrated Global Greenhouse Gas Information System. This is conceived as an independent, observation-based information system for determining trends and distributions of greenhouse gases in the atmosphere and whether they are consistent with efforts to reduce emissions. Its aim is to improve the granularity of observations and analyses in order to support planning of mitigation efforts.

The World Meteorological Congress recently agreed to the proposal of the Global Framework for Climate Services (GFCS) to include energy as the fifth GFCS priority area. This decision recognizes the role of climate services in the promotion of renewable energy

sources and *energy* saving, as well as in the protection of energy infrastructure and delivery systems from weather and climate extremes. As energy is a revenue-generating sector, the provision of energy-related climate services presents a considerable opportunity for NMHSs to support policy implementation on a sustainable basis. This decision is in line with other United Nations targets and the prioritization of low-emission power generation as a key strategic result of the projects funded via the Green Climate Fund (see below).

Observing systems operated by WMO Members provide the data needed to monitor climate change and the efficacy of policies and measures to combat it. Therefore efforts need to be made to ensure that the observations crucial to our understanding of atmospheric and terrestrial systems – including the hydrosphere, biosphere, and cryosphere – are moved from a largely research driven funding base to one capable of sustaining a secure, long term monitoring network.

Adaptation

Climate services, such as those developed under the Global Framework for Climate Services (GFCS), provide essential information for adaptation at the national and local levels and should receive commensurate support.

NMHSs can help to meet the demand for climate services to address climate change and adaptation, particularly at the local level, by combining climate-change projections with local climate data and knowledge. These products can then be used to devise adaptation strategies including preparing for, and adjusting to, changing patterns of extreme events. NMHSs are critical actors in national development planning within almost all sectors. Key services include providing information and scientific advice on climate variability, trends and change, including at the policy level. NMHSs are encouraged to provide technical advice in preparing and implementing National Adaptation Plans, which are expected to guide the allocation of significant climate finance in the future.

The Global Framework for Climate Services (GFCS) helps governments build the capacities needed to better anticipate the impacts of evolving climate conditions, including possible increases in climate extremes. This includes bridging global, regional, national and local information gaps; incorporating climate information into various socioeconomic sectors; research, modelling and prediction; and developing mitigation and adaptation measures. Implementation of the GFCS at country level, therefore, provides a key mechanism for implementing adaptation.

Loss and Damage

Monitoring and cataloging of extreme events and climate trends is crucial for tracking climate-related loss and damage. Enhanced capabilities to monitor and model future climate conditions will improve attribution of extreme weather events to climate change and facilitate preparedness and adaptation at all time scales.

As signified by the launch of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts, risk management has become a central element within UNFCCC. With the adoption of the Sendai Framework for Disaster Risk Reduction

earlier this year, the climate change and disaster risk reduction agendas have continued to convergence. As most disaster-related loss and damage is associated with climate-related hazards, integrating disaster risk reduction into climate services has the potential to generate multiple synergies.

The Seventeenth World Meteorological Congress decided to standardize the weather, water, climate, space weather and other related environmental hazard and risk information and develop identifiers for cataloguing weather, water and climate extreme events. These measures will promote interoperability among datasets and facilitate Members' efforts to assess risks and track climate-related loss and damage. NMHSs have a vital role to play in the collection, provision and quality assurance of these data, including the official designation/validation of extreme events and archiving of event data and trend indices.

Technology transfer/capacity development

Climate action depends on the availability of high-quality scientific information. Climate data, science, information and knowledge are critical contributions to all facets of development under a changing climate. There is an urgent need to build the scientific and operational capability of institutions around the world to underpin the information and service needs of policymakers and vulnerable communities. WMO capacity development activities help to ensure that NMHSs have the required technical infrastructure, legal and institutional framework, staff competencies, as well as financial, political, regional and other resources. Capacity-building mechanisms under the Convention are currently weak, however, and ways and means under the Convention need to be found to promote standing capacities within institutions such as WMO to enable them to provide vigorous and sustained capacity development support in all areas covered by the Convention.

Climate finance

Projects to be financed by the Green Climate Fund in support of climate change actions, for both mitigation and adaptation, should be climate-proof and include provisions for developing new, or strengthening existing, human and technical observing and modelling capabilities in support of climate services delivery enhancement.

The Seventeenth World Meteorological Congress adopted a policy for the free and open international exchange of climate-relevant data, tools and scientifically based methods to ensure greater availability of, access to, and use of enhanced climate services for all countries, while respecting national and international policies. Adoption of this policy will require Members to establish financial mechanisms, including new investments, for sustaining the network of stations and sensors needed for the global climate observing systems. As the contributions covered by the policy are vital to UNFCCC implementation, climate-financing resources may provide a means for supporting the necessary observing systems and data management and exchange.

The Green Climate Fund (GCF), launched in 2014 with current pledges exceeding USD 10 billion, will allocate half of its resources to mitigation and half to adaptation. The GCF has eight strategic results, including low-emission power generation and increased health, food,

water and livelihood security. Climate services as a tool for adaptation at the national and local levels are therefore eligible for GCF funding, as are climate services for renewable energy that contribute to mitigation. Countries wishing to access the GCF will designate Nationally Designated Authorities that will oversee preparation and submission of projects. United Nations agencies are also eligible to access the Fund and WMO has submitted a request for accreditation.

附錄五、《巴黎協定》的重要條文與內容對照表

(國立臺北大學 自然資源與環境管理研究所 李堅明副教授兼所長 提供)

條文	內容
第二條 (全球溫升控制目標)	控制全球平均溫升低於2℃(相較於工業革命前)，且努力追求全球平均溫升低於1.5℃(相較於工業革命前)。
第三條 (NDC)	締約國應努力執行NDC，應該逐年進展。
第四條 (NDC)	1. 締約國應儘速達到溫室氣體排放峰值(peak)。 2. 締約國應依據共同但責任差異原則，提出更積極的NDC 目標。 3. 已開發國家應達到絕對減量，開發中國家應持續加強減緩的努力。 4. NDC 應該每 5 年查驗其成效。
第五條 (森林保育)	締約國應致力於森林保育與碳匯功能，並應提供獎勵誘因 (result-base payment)。此外，重申森林保育的非碳效益(non-carbon benefit)的重要性。
第六條 (減量合作)	為協助締約國達成及研擬更積極的NDC 目標，樂見締約國間的自願性減量合作機制。
第七條 (調適)	1. 締約國應建立調適能力、強化韌性(或恢復力)與降低脆弱性之全球調適目標。 2. 締約國應考量「坎昆調適架構」(Cancun Adaptation Framework)(分享經驗、加強制度安排及加強科學知識等)，加強合作。
第八條 (降低損失與損害)	締約國應透過「華沙損失與損害國際機制」加強對氣候變遷造成損害的瞭解、行動及支持，包括： 早期警報系統、緊急應變措施、風險評估、氣候保險機制及非經濟損失等。
第九條 (財務機制)	1. 已開發國家應提供開發中國家減緩與調適的財務支持。 2. 財務額度規模應逐漸擴大，且應以平衡減緩與調適之財務資金為目標。 3. 公約的財務機制應納入本協定的財務機制。
第十條 (技術發展與移轉)	1. 締約國應瞭解技術發展與移轉對提高氣候變遷韌性與降低溫室氣體排放的重要性。 2. 公約的技術機制應納入本協定之技術機制。
第十一條 (能力建設)	締約國應協助氣候脆弱國家氣候因應的能力建設，包括減緩與調適行動、技術移轉與發展、氣候財務、提供氣候認知之教育與訓練。
第十二條 (氣候教育)	締約國應加強氣候教育與訓練，提高國民認知，並促進氣候因應行動。
第十三條 (締約國互信機制)	為提高締約國間的互信，及促進有效執行減量措施， 應加強締約國行動及支持系統的透明性。爰此，締約國應提供如下資訊： 1. 依據IPCC 最佳作法之國家GHG 盤查資料； 2. NDC 執行進展。
第十四條 (本協定評鑑)	締約國會議應定期評鑑本協定之長期目標的進展。
第十五條 (遵約機制)	為促進本協定的有效執行，應建立適當的遵約機制(compliance mechanism)。爰此，應成立一個專家委員會，且委員會應特別考量各國國情與能力的差異性。
第十六條 (成立附屬機構)	為執行本協定，應成立附屬機構，協助相關事務性工作的進行。
第十七條 (成立秘書處)	為執行本協定，應成立秘書處，協助相關事務性工作的推動。

第十八條 (公約附屬機構納入本協定)	公約之SBI(Subsidiary Body for Implementation)及SUBSTA(Subsidiary Body for Scientific and Technological Advice)2 個附屬機構，應納為本協定之附屬機構。
第十九條 (公約附屬機構與本協定整合)	公約之附屬機構的工作項目，應整合入本協定之相關工作。
第二十條 (簽署與批准)	本協定應開放締約國簽署(signature)與批准(ratify)，時間為2016 年4 月22 日至 2017 年4月21 日。
第二十一條 (協定生效)	當批准國家數量超過55 個，且總溫室氣體排放量占比超過55%，則自該日之後的第13 天，本協定將自動生效。