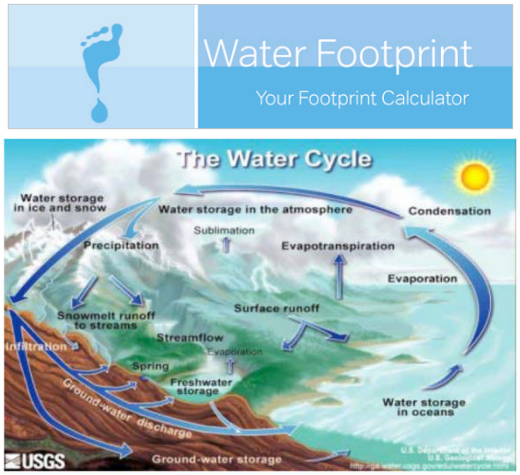
ALLIANCE FOR WATER STEWARDSHIP

水足跡國際標準與查證流程



鮑柏宇 (Stephen Pao)

全球永續產品發展經理

台灣檢驗科技股份有限公司

SGS Taiwan Ltd.

About the speaker

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CONTENTS

水、能源與氣候變遷議題
Water, Energy and Climate Change Issues

Inextricably linked

Water is used to generate energy; energy is used to provide water.

Demand are increasing

people use more energy and water for refrigerators, swimming pools, transport, watering and cooling that meet their new lifestyle and diet needs.

Impacted ecosystems

Water, energy and ecological footprints cannot be addressed in isolation.

Climate change risk

The appropriate and sustainable use of water and energy resources locally.

Becoming better able to cope with an uncertain future

Leadership and Policy

Technology, innovation, a sense of shared responsibility and political will are factors that bring real solutions as we strive to keep pace with increasing needs from a growing population

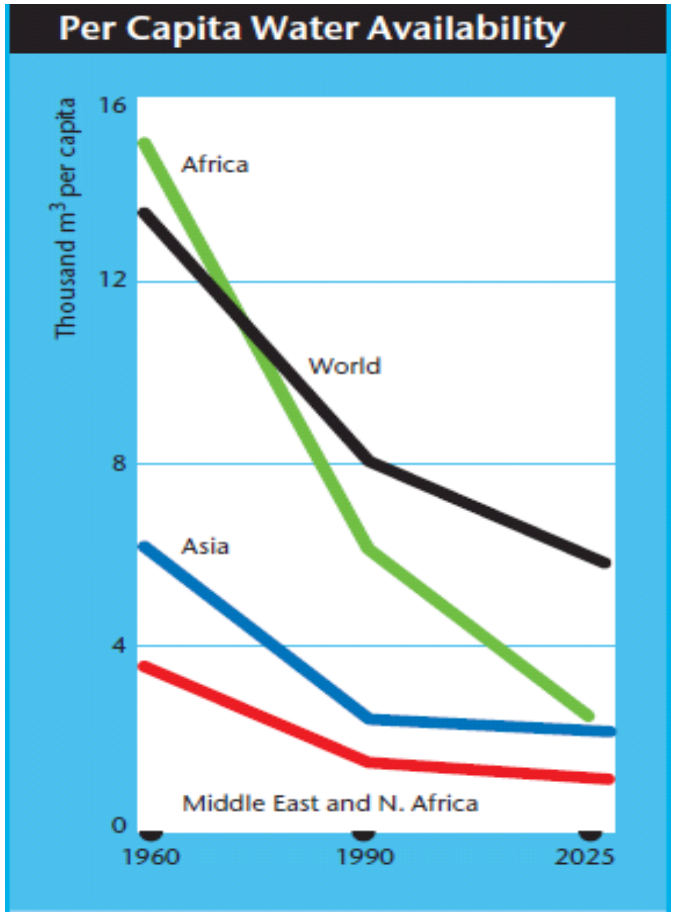
全球水文極端化

- **氣候變遷&降雨變化預測 (IPCC AR4)**
  - 熱帶區域以及熱帶太平洋的降水增加
  - **亞熱帶地區，降水減少**
  - 高緯度地區的降水增加
  - 全球平均的水氣量、蒸發量、與降雨量增加，但平均降雨量的增加幅度比水氣量的增加幅度小。 **極端降雨現象增加**
  - 豪大雨頻率增加
  - 連續不降雨天數變長
  - 夏季的大區域陸地中有逐漸變乾的趨勢，未來該區域發生乾旱的機率大增

全球水文極端事件記錄

- 美國西南部、東南亞、東南美洲、澳洲西部、南歐，以及非洲南部和北部等地，50年內可能會發生無法逆轉的乾旱（即永久沙漠化)
- 中國北方地區，10米深的裂縫開始在各地田間出現。水的使用若沒有重大改變的話，未來10年內，中國可能會出現數千萬的環境難民
- 巴西亞馬遜州的幾個地區，由於亞馬遜河創紀錄的水位高漲，才剛剛在 2009年面臨歷史性洪水，如今卻已經因爲乾旱而被孤立，坐船再也到達不了，只能靠徒步穿越森林
- 伊拉克、中國、查德、澳洲、蒙古、非洲的薩赫勒地區（Sahel）在內的地方，在2010年都遭受乾旱之苦
- 英國氣候越來越熱，夏季越來越乾燥，河流水量已減少 80%，可能導致極端的缺水情況
- 巴基斯坦洪災： 該國歷史上最嚴重的大洪水，導致兩千多人死亡，兩千多萬人受傷或無家可歸，五分之一的國土泡在水中
- 巴西在2010年4月和6月，也發生了極端嚴重的水災，每次皆有數百人死亡
- 波蘭在2010年5 月，遭受了幾十年來最嚴重的水災
- 大陸華南9省2010年6月經歷百年來最嚴重的一場水患，暴雨襲擊，重大災情陸續傳出
- 澳洲布里斯班經歷百年一遇最嚴重水災，市中心商業區斷電猶如死城，造成國內生產總值（GDP）減少約130億澳元
- 台灣2009年8月「莫拉克」風災災情 / 台灣地區暴雨襲擊事件頻率增高

全球水資源概況



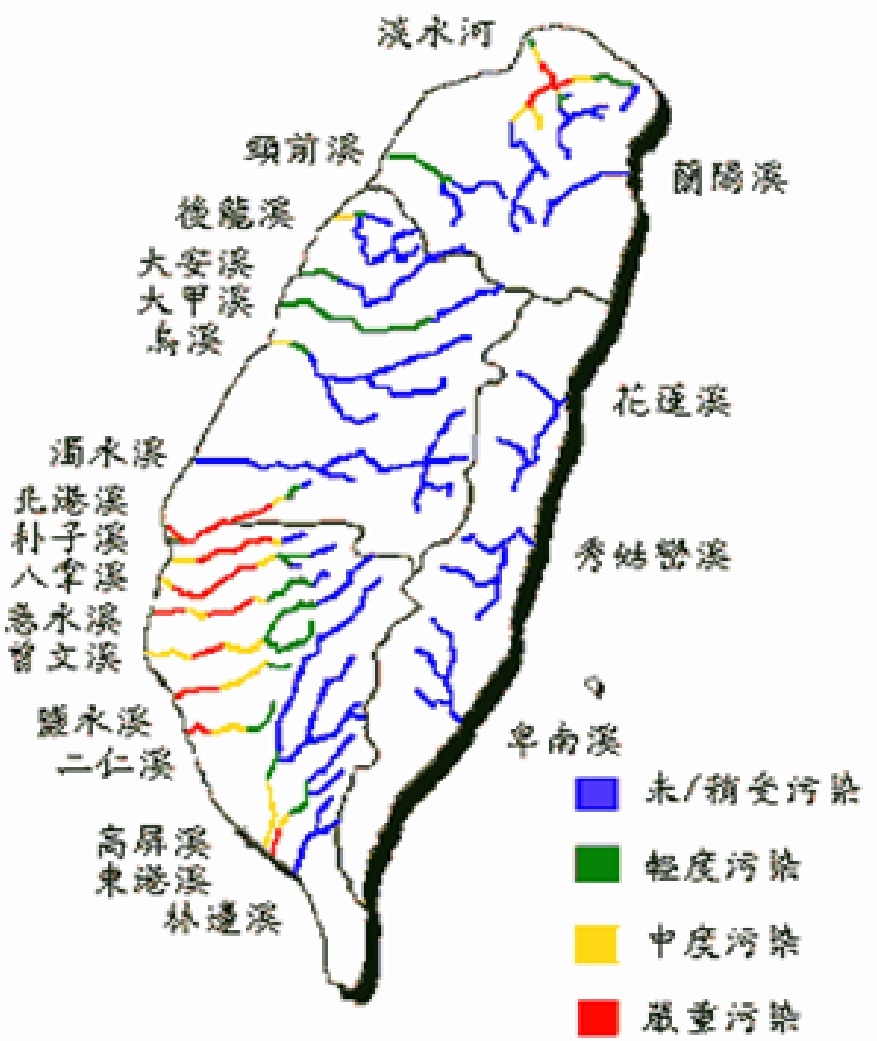
- 全球水資源狀況
  - 地球可用水資源＜3％(97％以上為無法直接利用之海水或靜止水)
  - 可用水3％中，2.5％位於南北極冰川及地底
  - 人類可用之水資源：＜0.5％
- 地球之水資源不會用盡、但並非永續可供人類「隨意使用」
- 氣候及全球各地季節極端異象，造成之乾旱及洪水事件等影響人類之食物及生活模式，投入災後成本也相對提高
- 水資源不當管理造成水資源短缺

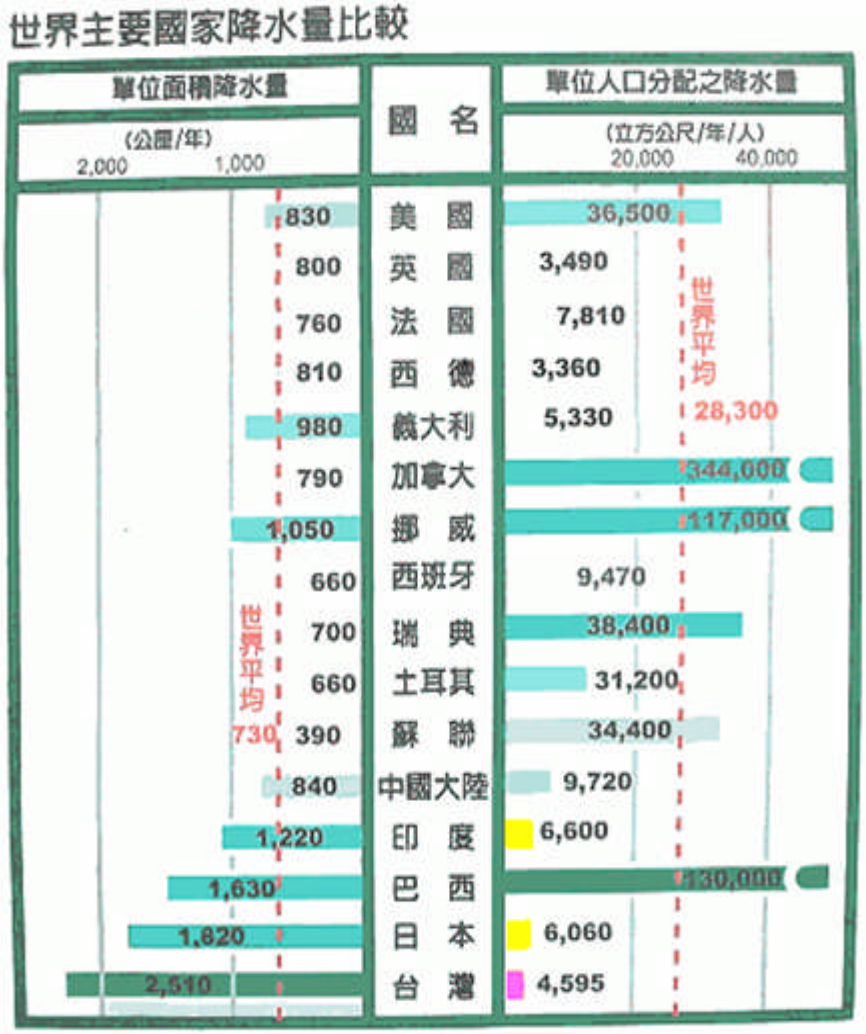
台灣地區水資源概況

- 台灣屬海島，四面環海，亞熱帶季風區氣候，年平均雨量達2,510公釐，
- 台灣水資源之主要來源：雨水，約為世界平均值之2.6倍
- 台灣雨水豐沛，水資源仍短缺？
  1) 地狹人稠，每人每年所分配雨量僅及世界平均值之七分之一，高居國際缺水排行榜第18名
  2) 雨量在時間及空間上之分佈極不均勻，五月至十月之雨量即佔全年之78%，枯水期長達六個月，河川坡陡流急、腹地狹隘，逕流量被攔蓄僅18%，其餘均奔流入海。
  3) 台灣水庫密度相當高，約40座但庫容不大，有效容量為20.51億立方公尺。

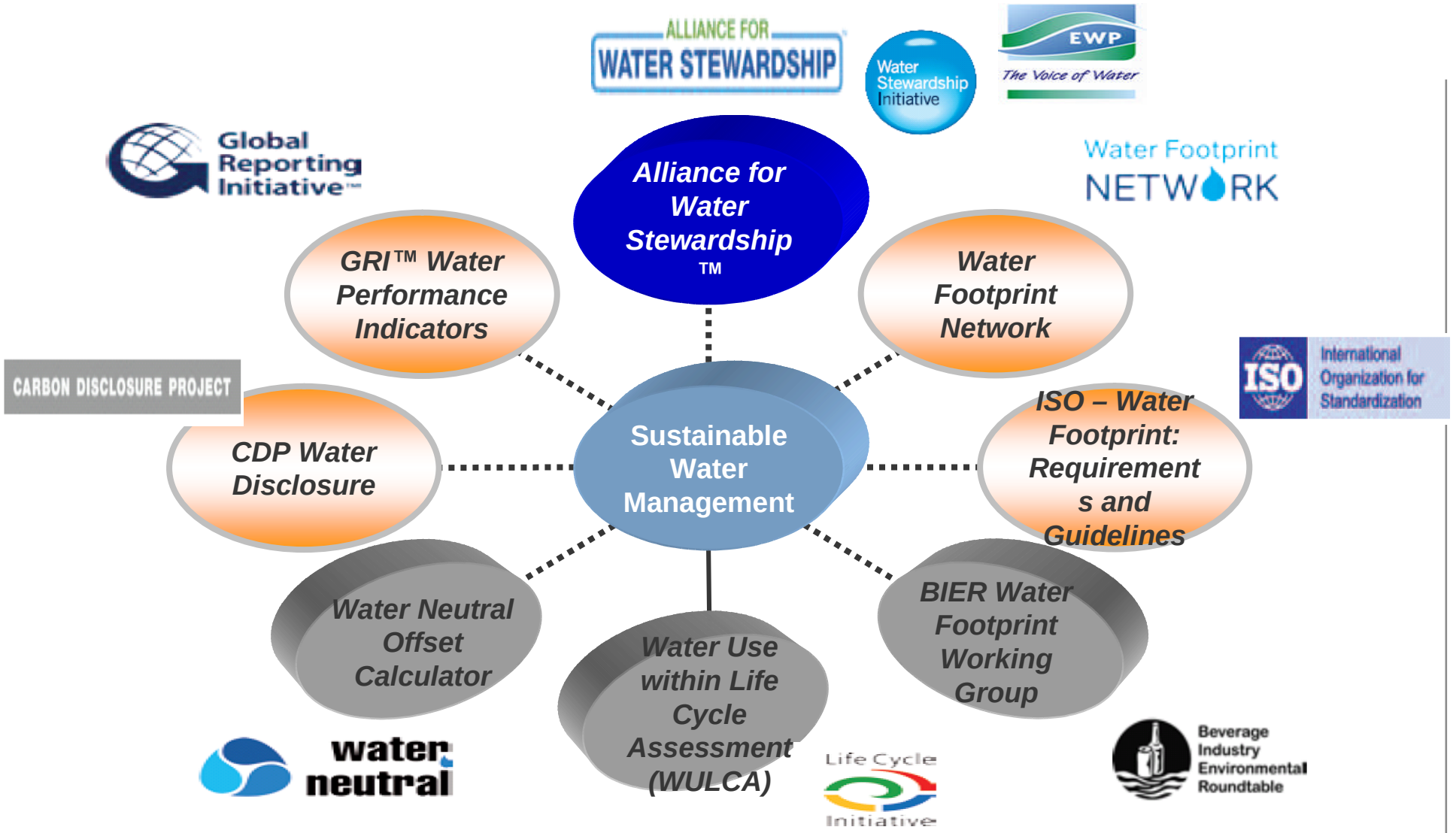
經濟部水利署 http://www.wra.gov.tw/ct.asp?xItem=11733&ctNode=2314&comefrom=lp

台灣地區水資源問題


淡水河
頭前溪
蘭陽溪
後龍溪
大安溪
大甲溪
烏溪
花蓮溪
濁水溪
北港溪
朴子溪
八掌溪
急水溪
曾文溪
秀姑巒溪
鹽水溪
二仁溪
卑南溪
高屏溪
東港溪
林邊溪
未/稍受污染
輕度污染
中度污染
嚴重污染


世界主要國家降水量比較
單位面積降水量
(公釐/年)
2,000
1,000
國名
單位人口分配之降水量
(立方公尺/年/人)
20,000
40,000
830 美國 36,500
800 英國 3,490
760 法國 7,810
810 西德 3,360
980 義大利 5,330
790 加拿大 344,000
1,050 挪威 117,000
660 西班牙 9,470
700 瑞典 38,400
660 土耳其 31,200
390 蘇聯 34,400
840 中國大陸 9,720
1,220 印度 6,600
1,630 巴西 130,000
1,820 日本 6,060
2,510 台灣 4,595
世界平均 730
世界平均 28,300

國際永續水資源管理發展趨勢
Global Sustainable Water Management Approach



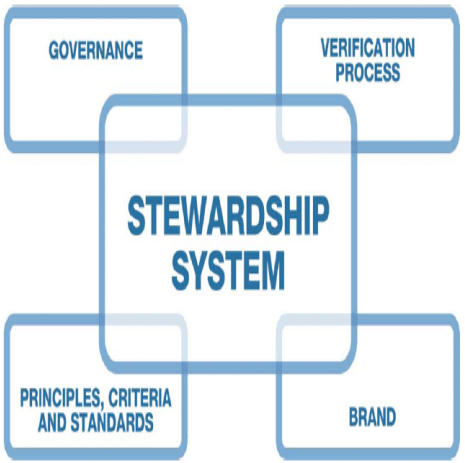
國際永續水資源管理策略
Sustainable Water Management Strategy

Key focus of the initiative

- Identify and assess water-related risks (鑑別估計與水相關的風險)
- Measure water use and assess water related impacts (測量水用途及估計水相關衝擊)
- Develop response options and/or risk mitigation strategies (發展對應及風險減緩策略)

永續水資源管理聯盟
Alliance for Water Stewardship Program

- 促進淡水使用責任，益於社會及環境永續，制定水資源管理標準
- 建立全球適用之水管理標準，大量用水者可透過此標準顯示用水效能及社會、環境及經濟永續達成程度促進淡水使用責任，益於社會及環境永續



- **International standards** with a focus on impacts of direct and indirect water use at the watershed level
- **Verification** to determine whether these standards have been met
- **Global brand** to allow users to demonstrate compliance
- **Training and education** to promote achievement of water stewardship
- **Pilot testing** and technical studies to refine the program through an iterativeprocess

- **AWS is building a water certification organization to be launched at the end of 2011.**

永續水資源管理聯盟
Alliance for Water Stewardship Program

The Nature Conservancy

Water Witness International

The Water Stewardship Initiative

Water Environment Federation®

Pacific Institute

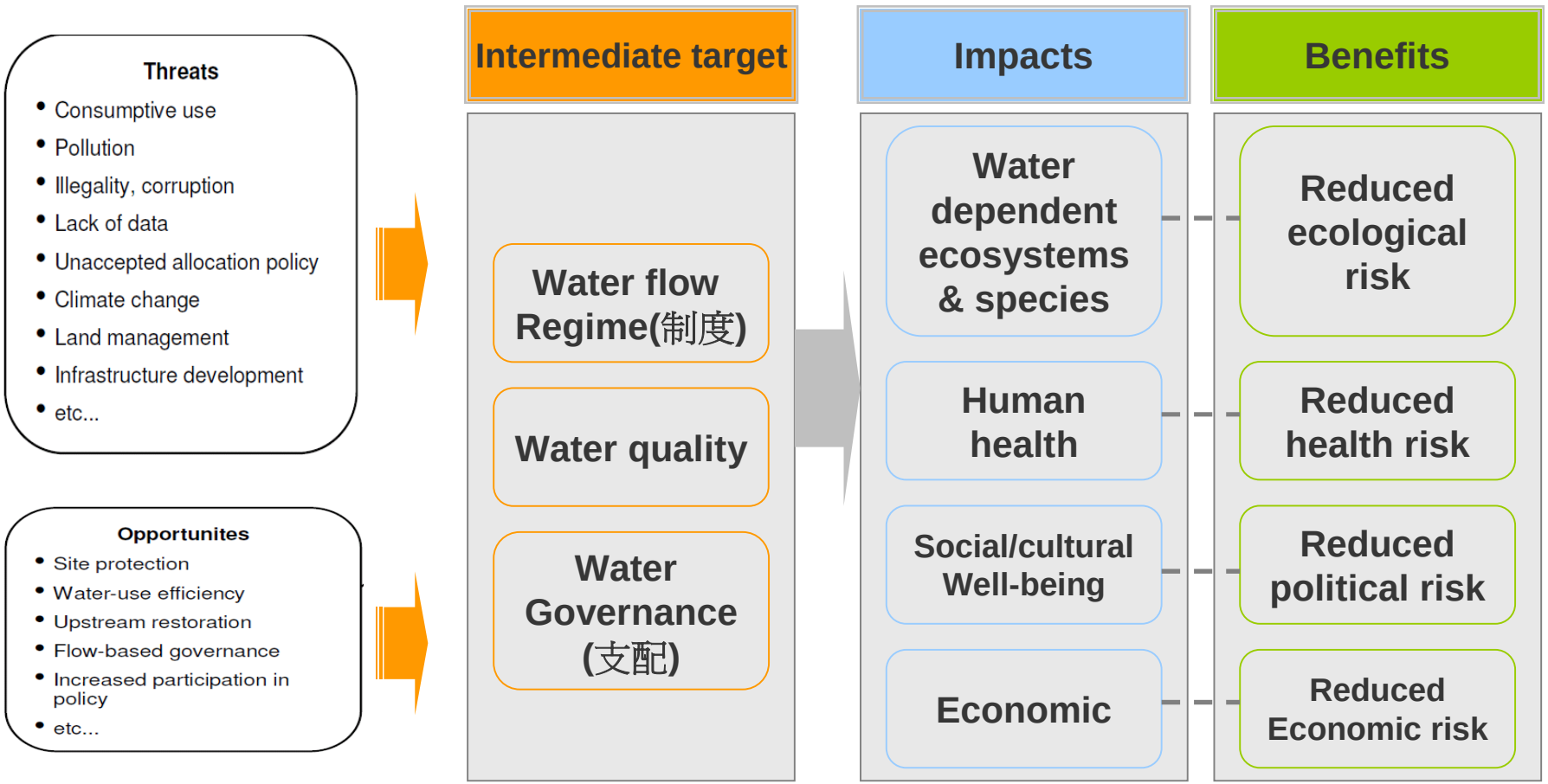
European Water Partnership

World Wildlife Fund

International Water Management Institute

- **建構水資源管理標準 (Water stewardship standard, WSS)**
  - 幫助企業處理與水相關的風險並且發掘企業對水的依賴性長期策略
- **企業參與水資源管理之關鍵焦點**
  - 鑑別估計企業與水議題相關之風險
  - 企業應測量水用途及估計水資源利用之衝擊
  - 發展水資源風險應對及減緩策略
- **水資源管理系統執行架構**
  - 環境管理系統(ISO 14001)架構
  - Plan-Do-Check-Act 概念
  - 生命週期評估方法 (WFN development)
  - 建構水資源永續管理目標

企業永續水資源管理策略分析



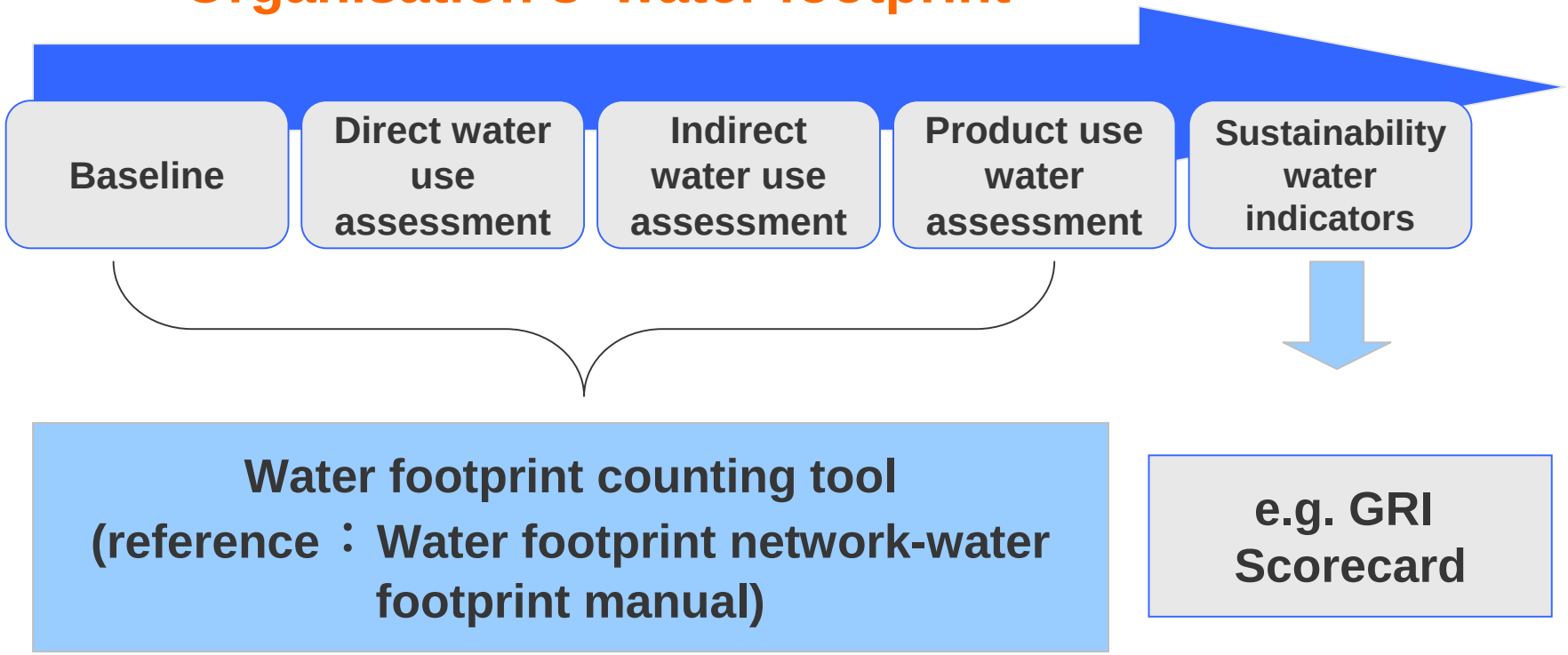
SMART目標管理：Specific（明確性）、Measurable（可衡量性）、Attainable（可達成性）、Relevant（相關性）和Tim-framed （時限性）。

CONTENTS

水資源管理標準 & 水足跡

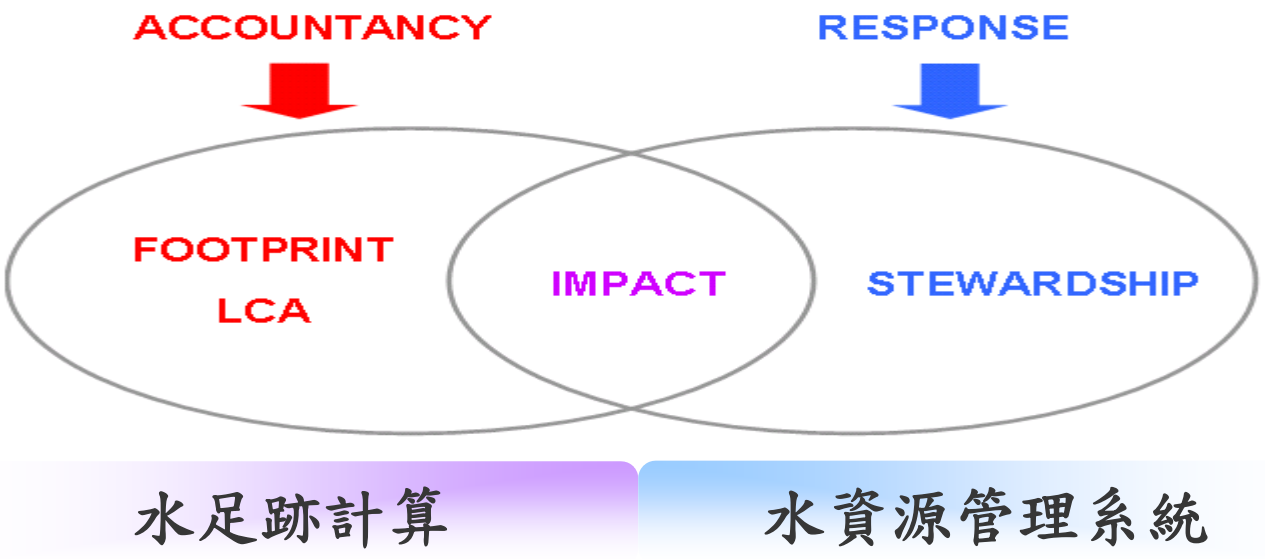
Water Stewardship Standard

Organisation's water footprint

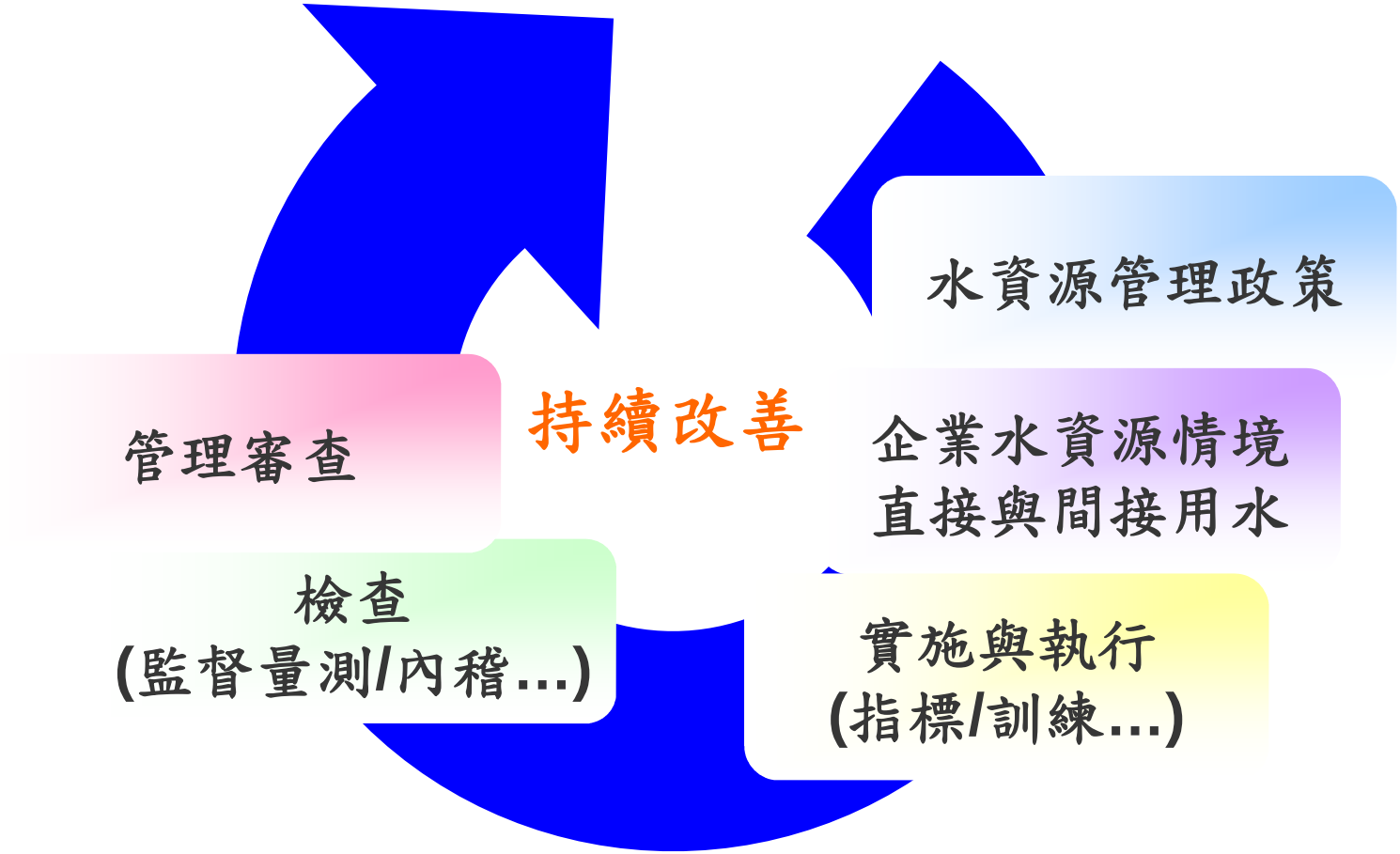


企業水資源議題管理工具

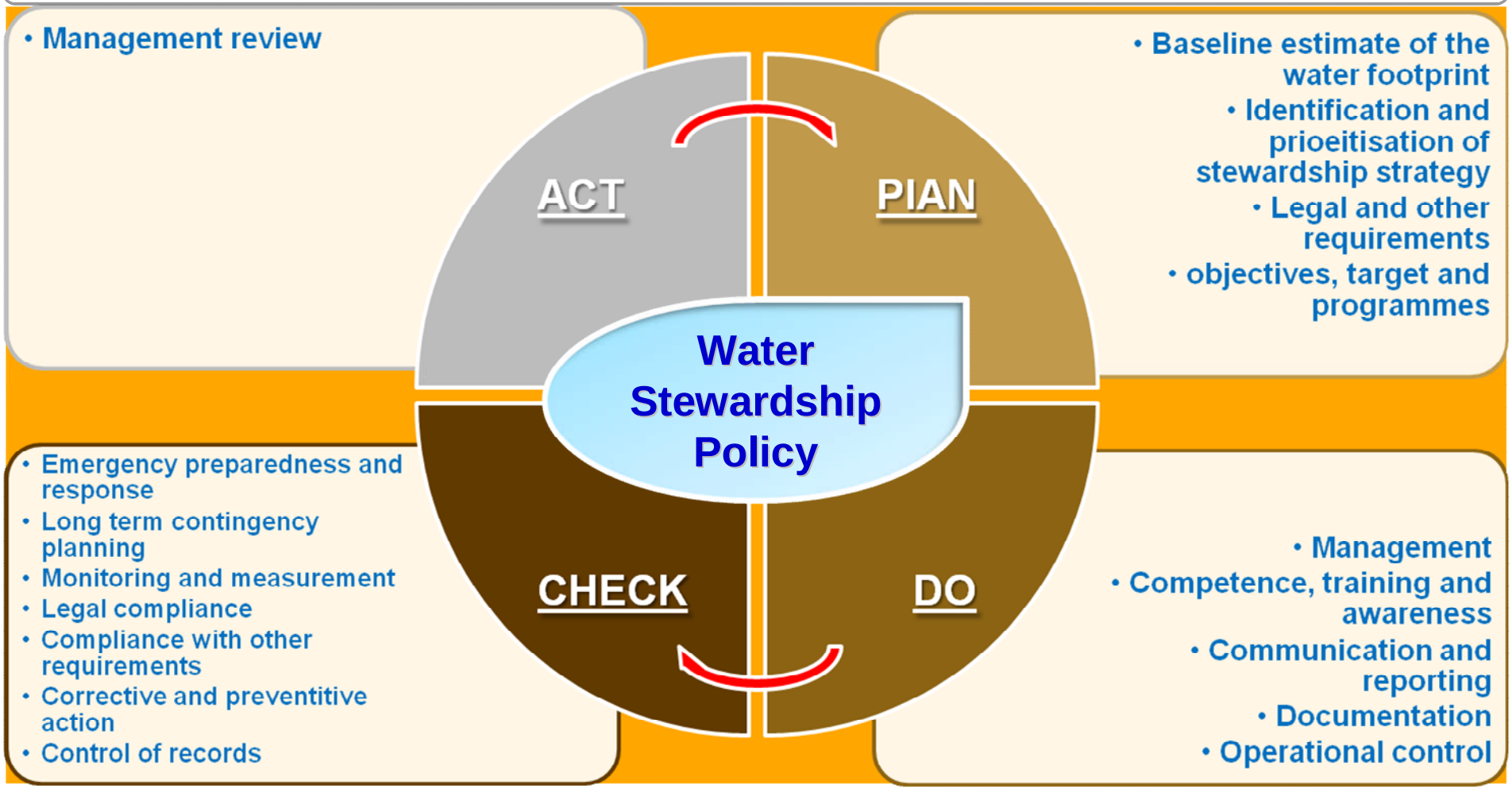
- **水資源管理工具將可協助企業掌控:**
  - 透過工具反應企業用水與環境、社會及經濟層面的衝擊性(量化)
  - 掌握及維護能承受的水風險管理(永續水資源管理)



水資源管理標準
Water Stewardship Standard



水資源管理標準內容
Water Stewardship Standard Requirements



What is “Water Footprint”?

- The water footprint is an indicator of freshwater use that looks at both direct and indirect water use of a consumer or producer.
- The Concept of “water footprint” was introduced by Hoekstra in 2002.
- The water footprint is a geographically explicit indicator, not only showing volumes of water use and pollution, but also the locations.

Why Water Footprint ?

- **Awareness raising (意識的覺醒)**
  - Audiences are listening
  - Complex water story
  - Risk assessment
- **Link to impact (風險衝擊)**
  - Roles and responsibilities
  - Intervention and response
  - Addressing risk
- **Driving stewardship ethic (驅動管理概念)**
  - Measurements
  - Standards

Major determinants of a water footprint

- **Consumption characteristics (消耗的特性)**
  - Consumption volume (消耗量)
  - Consumption pattern (消耗特性)

- **Production circumstances (生產狀況)**
  - Climate: evaporative demand at place of production
  - Agricultural practice: water use efficiency

Why businesses are interested?

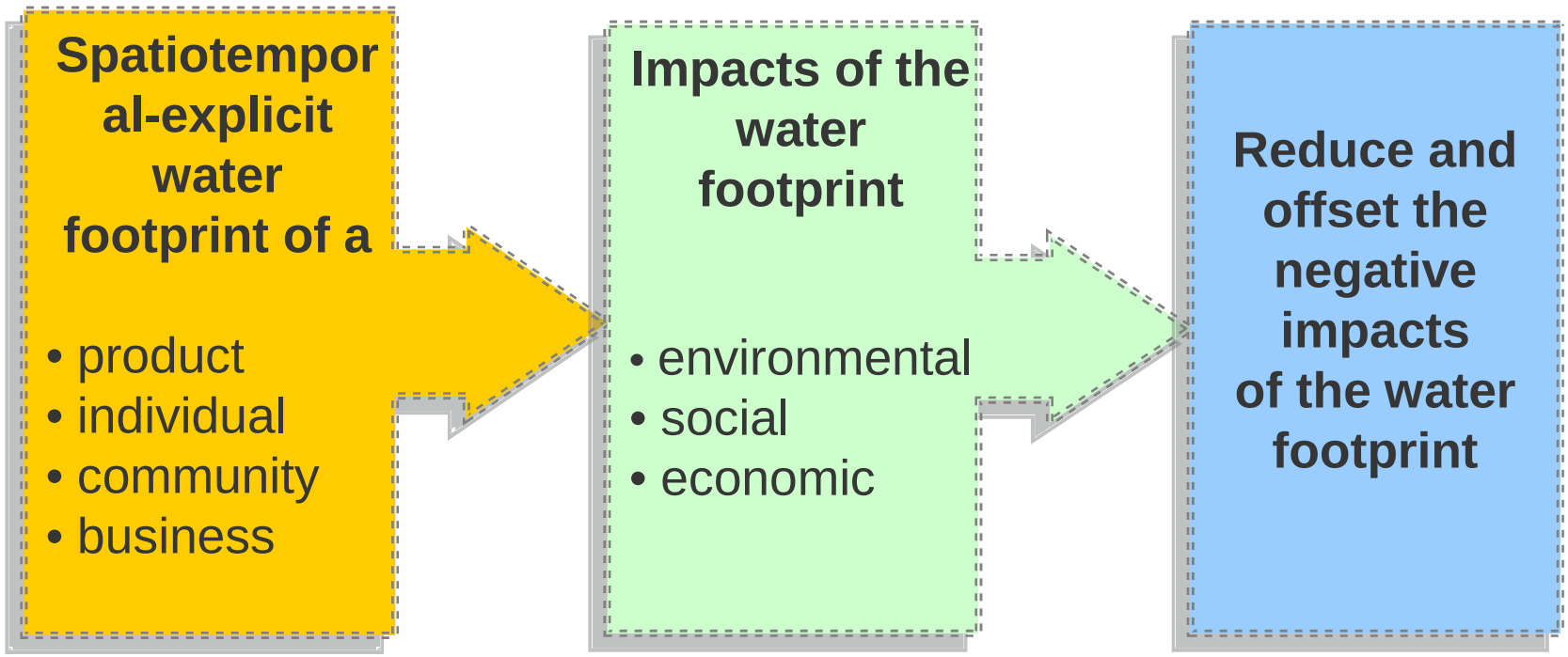
- Corporate social responsibility
- Corporate image / marketing perspective
- Business risks related to
  - - freshwater shortage for **own operations**
  - - freshwater shortage in **supply chain**
- Anticipate regulatory control

Water footprint vs. Carbon footprint

Items	Product Water Footprint	Product Carbon Footprint
時間、空間	spatial and temporal dimension	no spatial / temporal dimension
價值特性	actual, locally specific values	global average values
供應鏈	always referring to full supply-chain	supply-chain included only in ‘scope 3 carbon accounting’
目標	focus on reducing own water footprint (water use units are not interchangeable)	many efforts focused on offsetting (carbon emission units are interchangeable)
方法學	Life cycle assessment	Life cycle assessment

Water footprint and carbon footprint are “complementary” tools.

Water Footprint Accounting Map



Water Footprint Network

- Founded in October 2008 www.waterfootprint.org
- **Members**：Include the International Finance Corporation, the Netherlands Water Partnership, Twente University, UNESCO Institute for Water Education, the Water Neutral Foundation, WBCSD and WWF.
- **Support the transition towards sustainable, fair and efficient use of freshwater resources worldwide by:**
  - Advancing the water footprint concept - a spatially and temporally explicit indicator of direct and indirect water use
  - Increasing the water footprint awareness of communities, governments and businesses and their understanding of how consumption of goods and services and production chains relates to water use and impacts on freshwater systems
  - Encouraging forms of water governance that reduce the negative ecological and social impacts of the water footprint of communities, countries and businesses

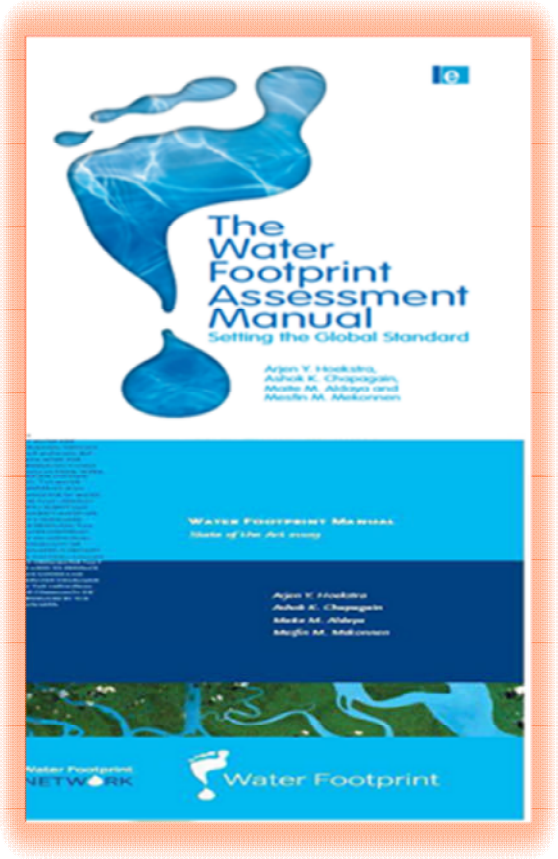
Water Footprint Network

- **Key activities**

  - **Standards development**
    - for water footprint accounting and sustainability assessment
  - **Practical tools**
    - to support people and organizations interested in water footprint accounting, sustainability assessment and reduction
  - **Guidelines**
    - on reduction of the negative impacts of water footprints

  - Technical support to water footprint assessment **pilots** with government bodies, NGOs, businesses and other organizations

The Water Footprint Assessment Manual



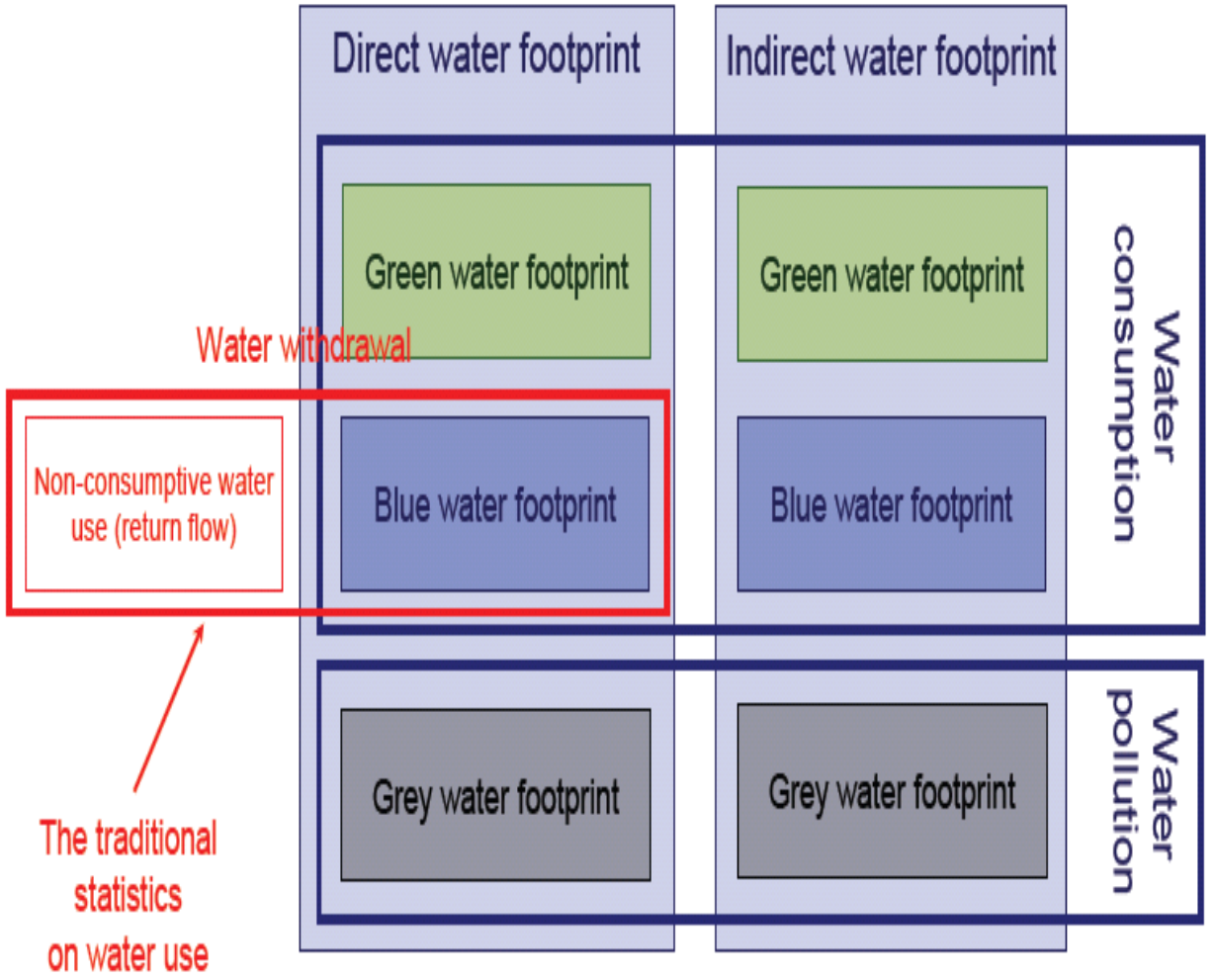
- **Water Footprint Manual** 為Water Footprint Network (暫譯：水足跡網絡組織)於2009年11月公告，2011年02月公告第二版
- 企業/產品水足跡定義：企業/產品於生產製造過程中所消耗的直接與間接用水量
- 水足跡計量重點
  - water volumes consumed (evaporated or otherwise not returned)
  - polluted per unit of time
- 水足跡評估類別:
  - Product 產品型水足跡
  - Consumer or group of consumers 消費型水足跡
  - Business企業(組織)型水足跡

各類別水足跡定義

藍水 **BLUE WATER FOOOTPRINT**	產品或服務生產流程中消耗之表面水/地下水之水量 **Volume of surface and groundwater consumed as a result of the production of a good or service.**
綠水 **GREEN WATER FOOOTPRINT**	生產流程中消耗之雨水量 **Volume of rainwater consumed during the production process.** (Green water refers to the precipitation on land that does not run off or recharge the groundwater but is stored in the soil or temporarily stays on top of the soil or vegetation.)
灰水 **GREY WATER FOOOTPRINT**	放流至承受水體標準時所消耗的稀釋水量 **defined as the volume of freshwater that is required to assimilate the load of pollutants based on existing ambient water quality standards.**

Water Footprint Manual

1. Setting goals and scope
2. Water footprint accounting
3. Water footprint sustainability assessment
4. Water footprint response formulation



水足跡量化公式

WFproduct = WF blue +WF green + WF grey

WF blue 藍水足跡 (地表水/地下水)

WFproc,blue = Evaporation + Incorporation + Lost Return flow

WF green 綠水足跡 (土壤含水)

WFproc,green = Evaporation +Incorporation

WF green 灰水足跡 (污水稀釋耗用水)

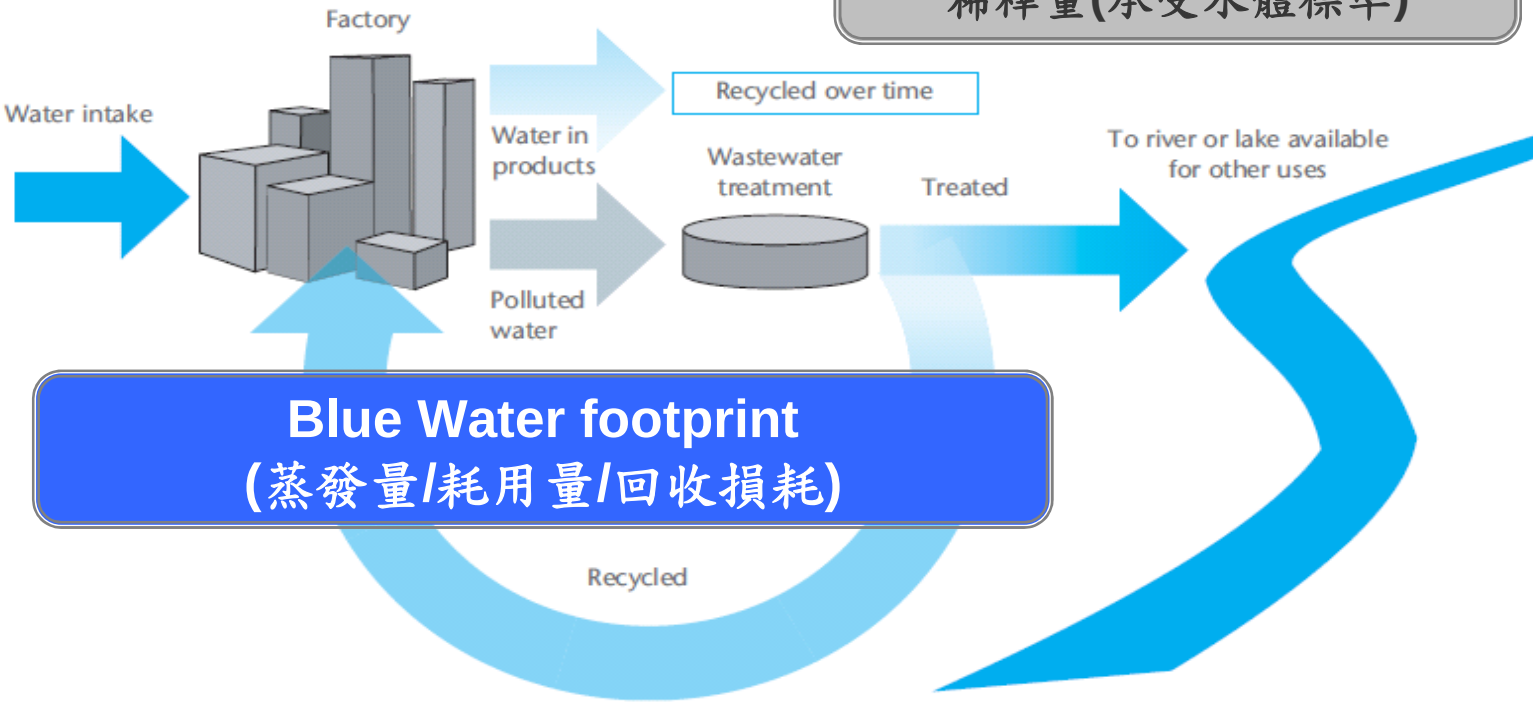
WFproc,grey = L / (C max — C nat)
WFproc,grey = E ffl × C ffl — C max
WFproc,grey = Effl × △T effl — △T max

- L : pollutant load
- Cmax : ambient water quality standard, maximum acceptable concentration
- Cnat : natural concentration in the receiving water body
- Effl : effluent volume
- Ceffl : concentration of the pollutant in the effluent

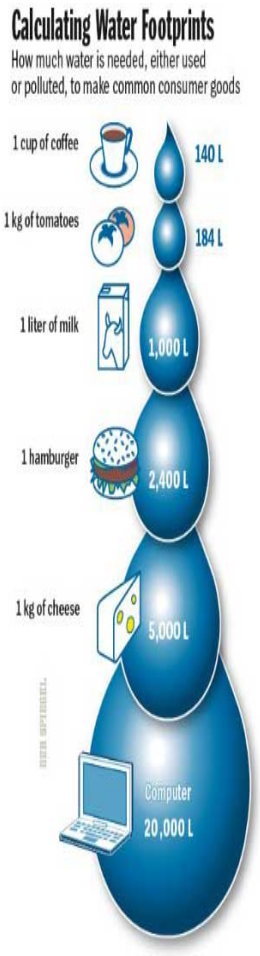
水足跡量化示意圖

Green Water footprint
(蒸發量/耗用量)

Grey Water footprint
稀釋量(承受水體標準)



Blue Water footprint
(蒸發量/耗用量/回收損耗)



theredmullet.blogspot.com/2009/08/water-footp...

水足跡計算邊界設定

Scope	Green / Blue / Grey water footprint
Truncation	Significant：larger than 1% or 10% or…etc
Spatiotemporal	

Level	Spatial	Temporal
Level A	Global average	Annual
Level B	National, regional or Catchment specific	Annual or monthly
Level C	Locally, site and field specific	Monthly or daily

Period of data	Year / specific years
Direct / indirect	direct footprinting / Indirect footprinting

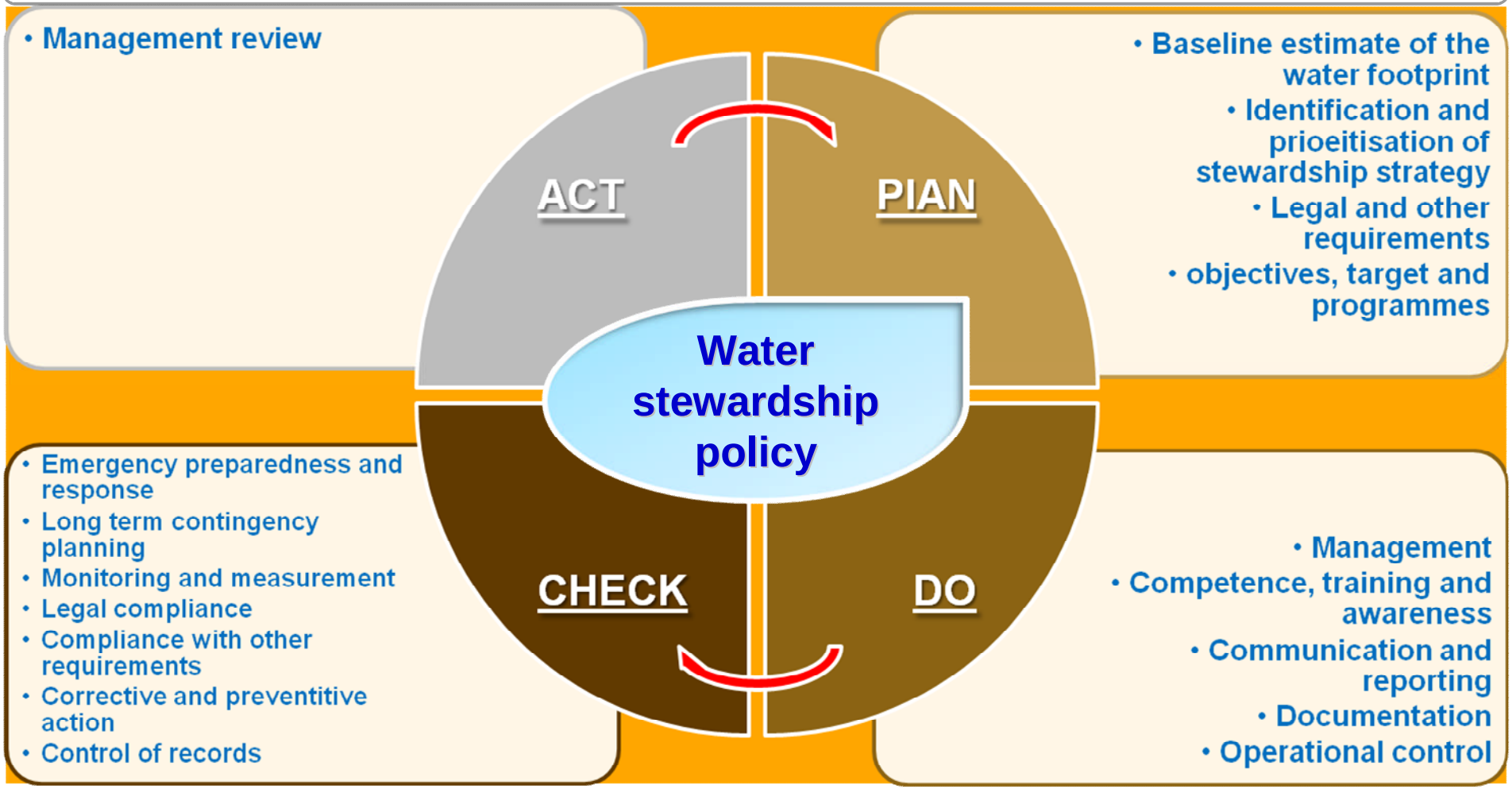
水足跡量化 & 標示

- When water footprint of a product or service is indicated, it is preferable that other environmental indicators are given simultaneously in order to facilitate wider consideration of environmental impact.

CONTENTS

SGS Sustainable Water Management System Certification

Water stewardship standard requirements



SGS Sustainable Water Management System Certification

Water Stewardship Policy

The organisation shall have a documented Water Stewardship Policy, endorsed by the organisation's top management including the organisation's commitment to the following Principles of Water Stewardship:

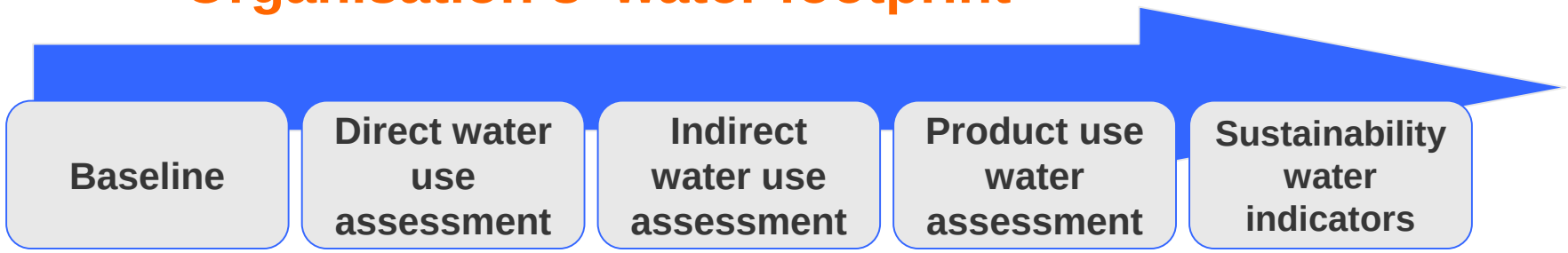
- Principle 1: Environmental flow regime
- Principle 2: Water quality
- Principle 3: Equitable governance

SGS Sustainable Water Management System Certification

- **Baseline estimate of the organisation's water footprint**
  - Baseline estimate of the organisation's water footprint
  - Direct water use assessment
  - Direct use catchment sustainability assessment
  - Indirect water use assessment
  - Product use-phase water use assessment

Water stewardship standard

Organisation's water footprint



SGS Sustainable Water Management System Certification

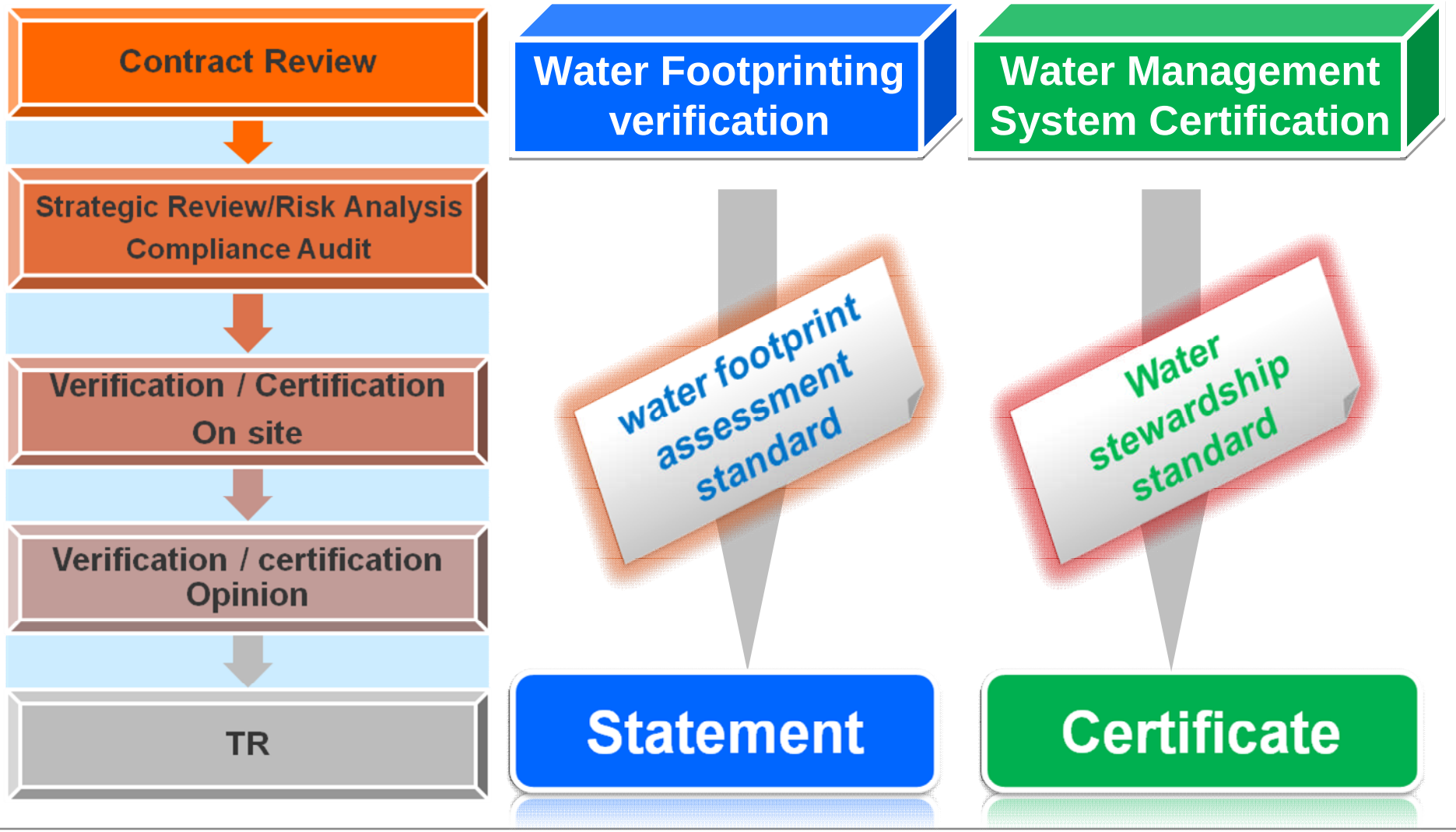
- **Emergency preparedness and response**
  - The organisation shall establish, maintain and if required implement policy and procedures to be followed in the event of exceptional or accidental events (e.g. drought, flood or accidental pollution) that would be expected to effect the organisational water stewardship indicators.
  - The organisation shall periodically review and, where necessary, revise its policy and procedures, in particular, after the occurrence of accidents or emergency situations.
  - The organisation shall also periodically test such procedures where practicable.

SGS Sustainable Water Management System Certification

Long term contingency planning

- The organisation shall identify and document the main external threats (e.g. the effects of climate change on water quality or supply, population growth) to the long term achievement of its water stewardship objectives, and document its long term strategy to respond to such threats.
- The organisation shall periodically review and, where necessary, revise its strategy.

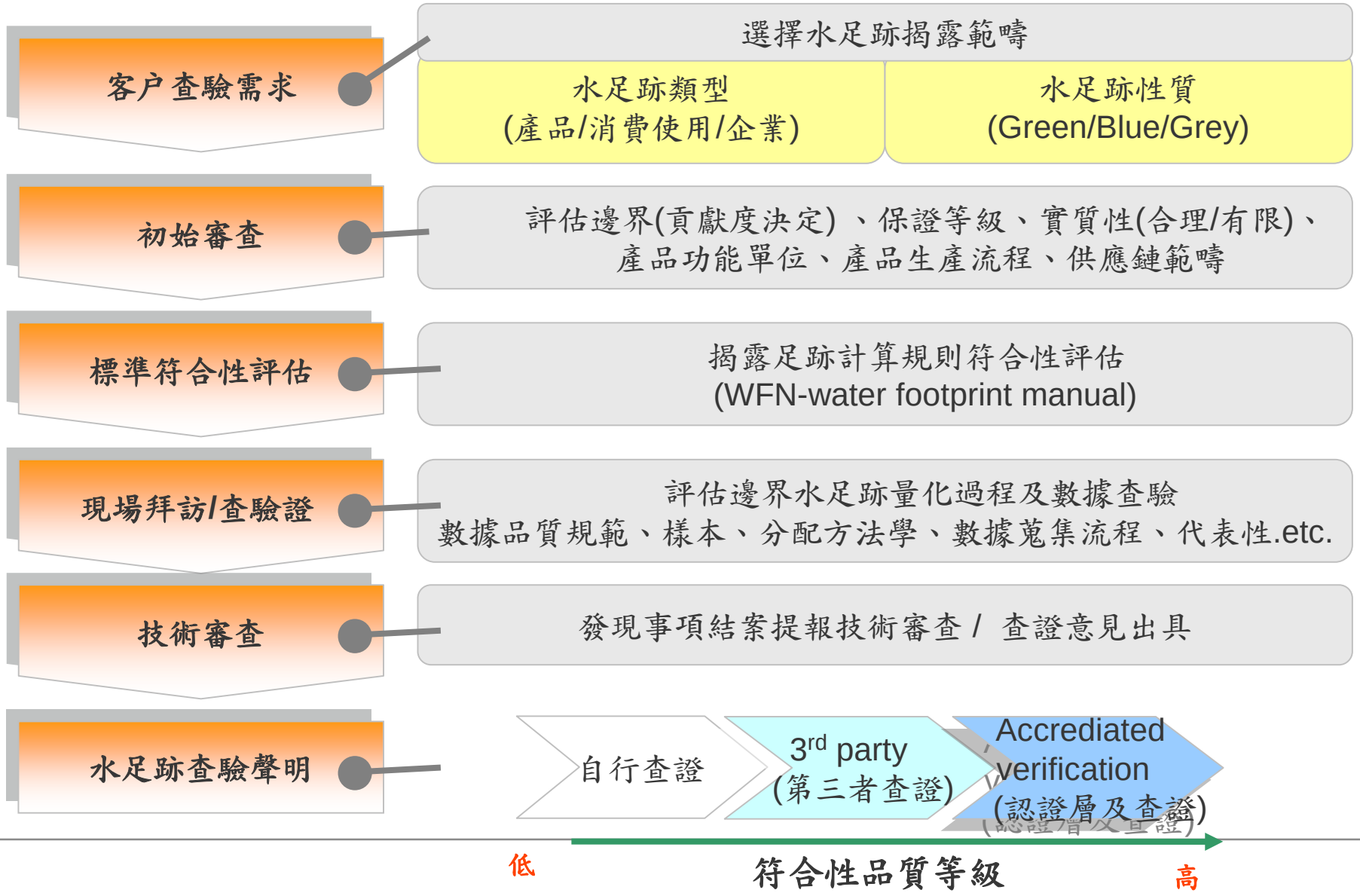
SGS Verification and Certification process



SGS Water Footprint Verification process

- Follow ISO 14065 requirements currently
- Refer to UKAS CFP accreditation requirements
- Adopt 14065 management procedures
- Water footprint verification process is developed based on CFP verification process & experience

SGS WFP verification process



ISO 14046
“Water Footprint: Requirements and Guidelines”

- Organization：WG 8, part of ISO / TC 207 / SC 5
- International standard for water footprinting
  - This International Standard specifies requirements and guidelines to assess and report water footprint based on LCA
  - **Methodology and reference**
    - **Product level : ISO 14040/44**
    - **Organization level：ISO 14064**
    - **Communication issues**
- **Working meetings**
  - Oct/Nov(TBC).2010: Third working meeting
    - Finalization of draft
  - Mar/Apr(TBC).2011: Fourth working meeting
    - Finalization of public consultation?
  - Jun/Jul/Aug/Sep(TBC).2011: Fifth working meeting
    - Finalization?

SGS MEANS BUSINESS

SGS

IN A WORLD WHERE COMPETING PRODUCTS AND SERVICES BEGIN TO LOOK THE SAME, IT'S THE PROCESSES AND SYSTEMS BEHIND THEM THAT MAKE THE REAL DIFFERENCE AND DELIVER COMPETITIVE ADVANTAGE

THANKS FOR YOUR COOPERATION

SGS Taiwan 國際驗證服務部 溫室氣體服務

System & Services Certification

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