



وزارة البيئة والمياه
Ministry of Environment & Water



Environmental Water Services Authority
EWS



WWF



Abu Dhabi Global
Environmental Data Initiative



Global
Footprint
Network

THE UAE ECOLOGICAL FOOTPRINT INITIATIVE

SUMMARY REPORT 2007-2010





Ministry of Environment and Water (MOEW)

The MOEW works to keep the environment clean and safe for the life and work of existing and future generations through integrated management of balanced ecosystems and ensuring sustainability of water resources and animal, fish and agricultural wealth, in cooperation with partners and within the international accepted criteria. Its vision is to *conserve the environment and natural resources for sustainable development.*

Abu Dhabi Global Environmental Data Initiative

(AGEDI) is a UAE government initiative championed by the Environment Agency - Abu Dhabi (EAD). The vision of the AGEDI is to have a world with no data or information 'gap' between or within developing and developed countries, where all people have easy and cost-effective access to quality environmental data and information for decisions that will enhance their personal well-being and the well-being of our planet; that is, a sustainable world.

Emirates Wildlife Society (EWS)

is a UAE-based environmental NGO. EWS is established under the patronage of HH Sheikh Hamdan bin Zayed Al Nahyan, Ruler's Representative in the Western region and Chairman of Environment Agency - Abu Dhabi (EAD). EWS works in association with WWF, one of the world's largest and most respected independent conservation organizations, with more than five million supporters and a global network active in over 100 countries. EWS-WWF has been active in the UAE since 2001 and has initiated and implemented several conservation and education projects in the region. The mission of EWS-WWF is to conserve the natural heritage of the UAE and to promote sustainable lifestyles.

For more information please visit www.ewswwf.ae

Global Footprint Network (GFN)

The GFN promotes a sustainable economy by advancing the Ecological Footprint, a tool that makes sustainability measurable. Together with its partners, the Network coordinates research, develops methodological standards, and provides decision makers with robust resource accounts to help the human economy operate within the Earth's ecological limits.



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CH.1

FOREWORD

By HE Dr Rashid Bin Fahed *Minister of Environment and Water*

Since its launch in September 2007, the Al Basma Al Beeiyah (UAE Ecological Footprint) Initiative, or EFI, has been an inspiring journey for all involved. The UAE is only the third country in the world, after Switzerland and Japan, to conduct such in-depth research into its Ecological Footprint. The EFI is raising public awareness on the issue, and it has recently developed a 'first of a kind' science-based tool to assist with policy design for the power and desalinated water sectors.

While living in such a harsh climate does inevitably cause people to consume a lot of resources, particularly energy, our work shows that the UAE wants to develop more sustainably – and that this desire is translating into action on the ground. Moreover, this unique initiative is being complemented by other activities, including renewable energy targets, green building codes, the Masdar initiative, public transport systems, energy/water demand side-management programs and the Heroes of the UAE campaign. These initiatives show that in order to be successful in securing a more sustainable future for the UAE, significant cross-sectoral and institutional collaboration is needed. I am proud to say that the EFI has demonstrated unprecedented levels of collaboration that I hope will continue long into the future.

The EFI has met all its objectives and goals of assisting the country's inhabitants to better understand and monitor their natural resource consumption patterns. We have also been successful in highlighting the urgent need for science-based policy work that can measure the environmental implications of development in order to implement targeted and specific policies. Finally, we have used this science to inform unique awareness-raising activities, as a cultural shift towards conserving natural resources will be the backbone to sustain these changes.

I thank all the partners involved that have made it possible for these successes, including the Emirates Wildlife Society in association with WWF; Abu Dhabi Global Environment Data Initiative; and the Global Footprint Network. I look forward to the coming years when the UAE will continue to take a more active leadership role in sustainable development and environmental protection.



EXECUTIVE SUMMARY

Every two years, the World Wide Fund for Nature (WWF), the Global Footprint Network (GFN) and the Zoological Society of London (ZSL) release their *Living Planet Report* to an international audience. The purpose of the report is to provide a diagnostic assessment of the state of our world vis-à-vis biodiversity and human pressures on the Earth. It presents a variety of sustainability indicators, including the Living Planet Index (mapping global biodiversity trends), the Water Footprint (supply and demand of water resources), and the Ecological Footprint (EF), which is an indicator of the relationship between human consumption of the Earth's resources, such as energy, food, fiber and timber, and the planet's ability to regenerate those resources.

In the 2006 *Living Planet Report*, based on 2003 data, the UAE ranked as the country with the highest per capita EF in the world at almost 12 global hectares (gha) per person. Left unchecked, this 'ecological overdraft' will impact the country's economy and society, as it is predicted that demand for resources such as energy and water will soon outstrip supply.

11.68 GHA
PER PERSON

IN 2006 THE UAE'S PER CAPITA ECOLOGICAL FOOTPRINT WAS AMONGST THE HIGHEST IN THE WORLD

The EFI was set up to address the UAE's high per capita Ecological Footprint (EF)

In 2007, the UAE government took significant measures to address the UAE's high EF, making it the third country in the world after Japan and Switzerland to embark on in-depth research to understand and manage its EF through an Ecological Footprint Initiative (EFI).

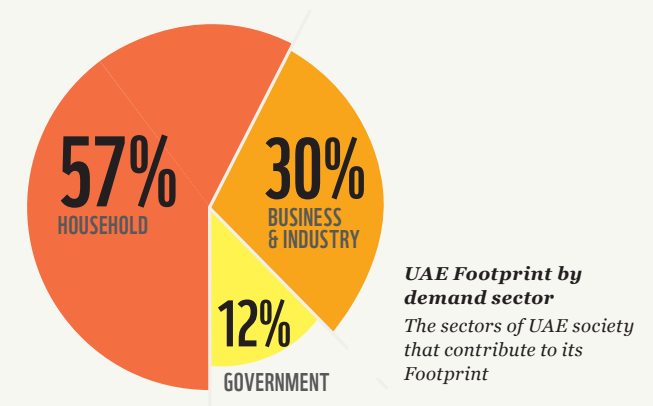
The UAE's EFI is made up of a partnership between the Ministry of Environment and Water (MOEW); Abu Dhabi Global Environment Data Initiative (AGEDI), a UAE Government initiative championed by Environment Agency - Abu Dhabi (EAD); the Emirates Wildlife Society in association with WWF (EWS-WWF); and the Global Footprint Network (GFN). Since 2007, this partnership has helped UAE government institutions and civil society build capacity and foster in-country knowledge and expertise by collaborating with the public, nongovernmental and private sectors, undertaking cutting-edge research and action in support of reducing the country's EF, and tackling related issues such as climate change.

2007
THE UAE EMBARKS ON IN-DEPTH RESEARCH TO UNDERSTAND AND MANAGE ITS ECOLOGICAL FOOTPRINT

The EFI has verified the UAE's Footprint and developed significant scientific knowledge

Some of the world's most advanced EF research and most innovative awareness-raising projects have been launched in the UAE, with support from the highest levels of government. Understanding and verifying the UAE's consumption patterns was crucial for the EFI to establish the foundations for work on awareness raising and policy development. A nation's EF account is made up of over 6,000 data points, meaning that verification is a task that requires continuous commitment and engagement. The EFI also concluded that the EF is an accurate estimate of the UAE's consumption patterns, but that there are some gaps in locally generated UAE data which require further research.

The EFI's research team broke the UAE's Footprint down into its contributing sectors, finding that households are the major contributors, responsible for 57%, followed by the business/industry and government sectors (30% and 12% respectively). This information was applied to the development of a sustainable lifestyles campaign known as 'Heroes of the UAE' (see page 7 for more information on the 'bottom-up' approach).



Innovative research facilitates policy development to reduce the UAE's Footprint

The EFI has conducted ground-breaking research to guide the development of effective policies that will lead to real Footprint reductions. As the EF is a static and retrospective indicator that does not give any indication of future trends or insight into critical national and policy-relevant issues such as energy and water, there is a need for the EFI to continue to develop cutting-edge science and research to provide more policy-relevant insights.

In 2009-2010, the UAE developed a scientific tool to track how the power and water sector's development might affect Abu Dhabi's carbon dioxide emissions and the UAE's per capita EF up to 2030. Led by researchers from EWS-WWF and the Masdar Institute, the tool assesses the impacts of policies such as renewable energy, more energy- and water-efficient equipment, and green building codes to decarbonize the power and water sector.

The technical work, supported by the GFN, was extensively informed by a comprehensive stakeholder consultation process for which key technical experts and policy makers from energy and water utility companies, as well as regulators, urban planners, academics, economists, businesses and government agencies, provided input, data and expertise.

The tool indicated that if the most ambitious measures were implemented in Abu Dhabi alone, by 2030 that emirate's CO₂ emissions could be reduced by up to 40% and the UAE's overall per capita Footprint could be reduced by 1 gha/person. Developing a more comprehensive strategy to reduce the UAE's CO₂ emissions and per capita Footprint will require a combined effort by all emirates. However, any strategy to reduce the carbon Footprint will fundamentally depend on the assessment of data and policy measures for other sectors, such as transport, manufacturing, oil/gas and land-use, along with a full economic and social assessment of the policies being implemented.

40%
OF ABU DHABI'S
CO₂ EMISSIONS
COULD BE
REDUCED BY 2030



The 'bottom up' approach: motivating behavioral change in society

The EFI has been raising public awareness about the EF, its relationship with climate change, and some of the practical solutions that can be applied to reduce it. To this end, the EFI has developed a range of educational and awareness-raising materials, including an award-winning animated film, a website (www.ecologicalfootprint.heroesoftheuae.ae), government workshops, university lectures and community events.

The Heroes of the UAE campaign, co-developed by EAD and EWS-WWF, engages the government, public, private and education sectors on the importance of conserving resources such as energy and water. Government sector engagement involves workshops and leading by example programs where government offices undergo 'green makeovers'. Engagement with the private and education sectors is similar, providing businesses and schools with the information and toolkits they need to conduct awareness campaigns and energy and water audits at their premises. See page 30 for more information.

As with the EFI's scientific achievements, these activities have received international recognition at various conferences. The UAE's EFI has thus been able to share its experiences with other countries and help the global community meet the challenges of sustainable development. It is and will continue to be an inspiration for other countries to make similar commitments.

INTRODUCTION

The world is in the midst of a global 'ecological credit crunch'. As populations grow and countries develop, some individuals and nations are consuming natural resources (including food, fiber, energy, water and timber) at an unsustainable rate and at the expense of the planet's health.

The irreversible repercussions, such as climate change and its impacts, food insecurity, collapsing fish stocks, and energy and water insecurity, are already causing environmental, economic and social instability around the globe.

The concept of sustainability and the need to balance environmental, social and economic concerns is a crucial challenge that must be measured and tackled. The EF is an indicator of the relationship between human consumption of natural resources and the Earth's ability to renew those resources. It shows whether people are living sustainably, by comparing their consumption of resources with the planet's ability to regenerate the resources and absorb our wastes. This determines whether and to what degree a population is depleting the Earth's resources faster than they can naturally be regenerated, living off an ecological 'overdraft' that will eventually lead to environmental collapse.



How fast we are running out of nature's resources !



TIME IS RUNNING OUT
 CONSUMPTION RATES OF NATURAL RESOURCES SUCH AS FOOD, FIBER, ENERGY, WATER AND TIMBER ACCESSED FROM WITHIN AND OUTSIDE THE UAE'S BORDERS ARE INCREASING

THE EF INDICATOR

3.1

The EF can be used as a tool to help answer the questions of what natural resources we have and at what pace we are using them. In order to understand and communicate a nation's Footprint, both the EF and the biocapacity of that nation need to be assessed and compared.

The EF is the population's demand for natural resources and ecological services (eg, the carbon sequestration capacity of the planet), while the biocapacity is defined as the capacity of ecosystems to absorb waste materials generated by the population (eg, carbon dioxide) and produce useful resources for human consumption.

Similar to the idea of supply and demand, biocapacity acts as a 'budget' of the planet's resources, while the EF represents the demand that the human population poses on those resources.



The EF is related to the net consumption of natural resources, accounting for trade, and it follows a simple equation:

$$EF_{\text{CONSUMED}} = EF_{\text{PRODUCED}} + EF_{\text{IMPORTED}} - EF_{\text{EXPORTED}}$$

Each nation is responsible for what is consumed within its borders, including the products that are imported for consumption there. The EF of products that are exported out of the country (oil and gas, in the case of the UAE) is attributed to the countries that consume them. For example, if Japan is consuming UAE oil, then all the energy required to extract, process, transport and burn the oil is considered part of Japan's EF (and not the UAE's).

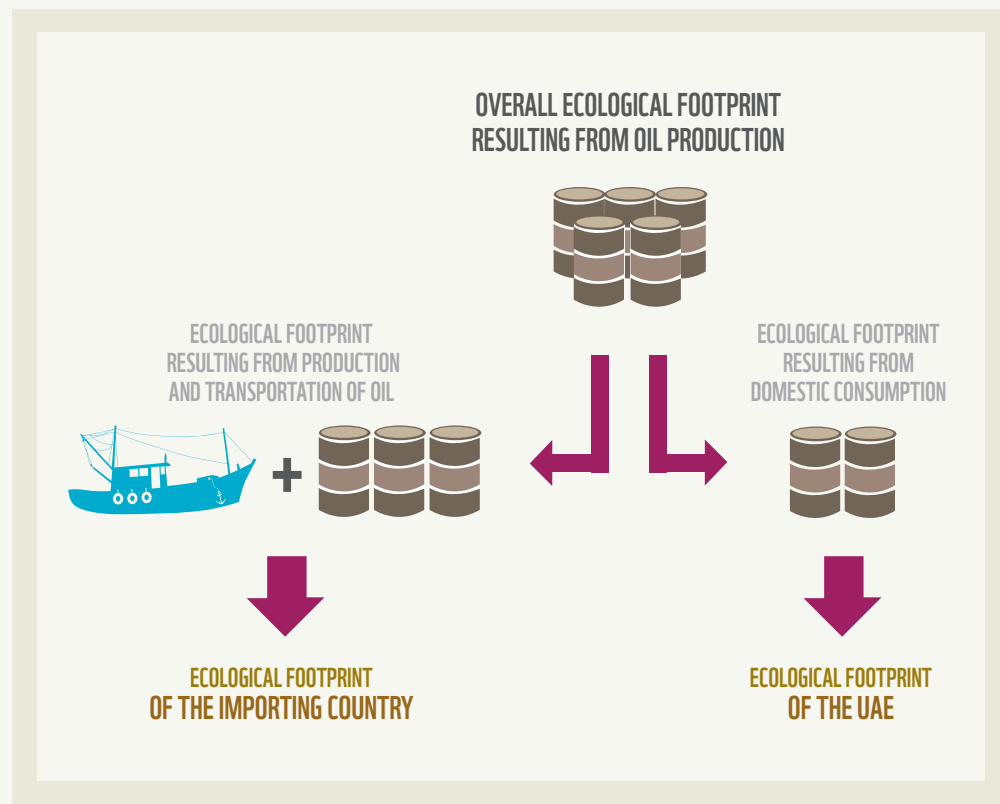


Figure 1: Illustration of the EF generated by the production, transportation and consumption of oil

The natural resources that humans consume are categorized into types depending on what type of land is used for their production. For this purpose there are six land types: cropland, grazing land, fisheries land, forest land, carbon uptake land (forested land required to assimilate CO₂ from the atmosphere or carbon footprint) and built-up land.

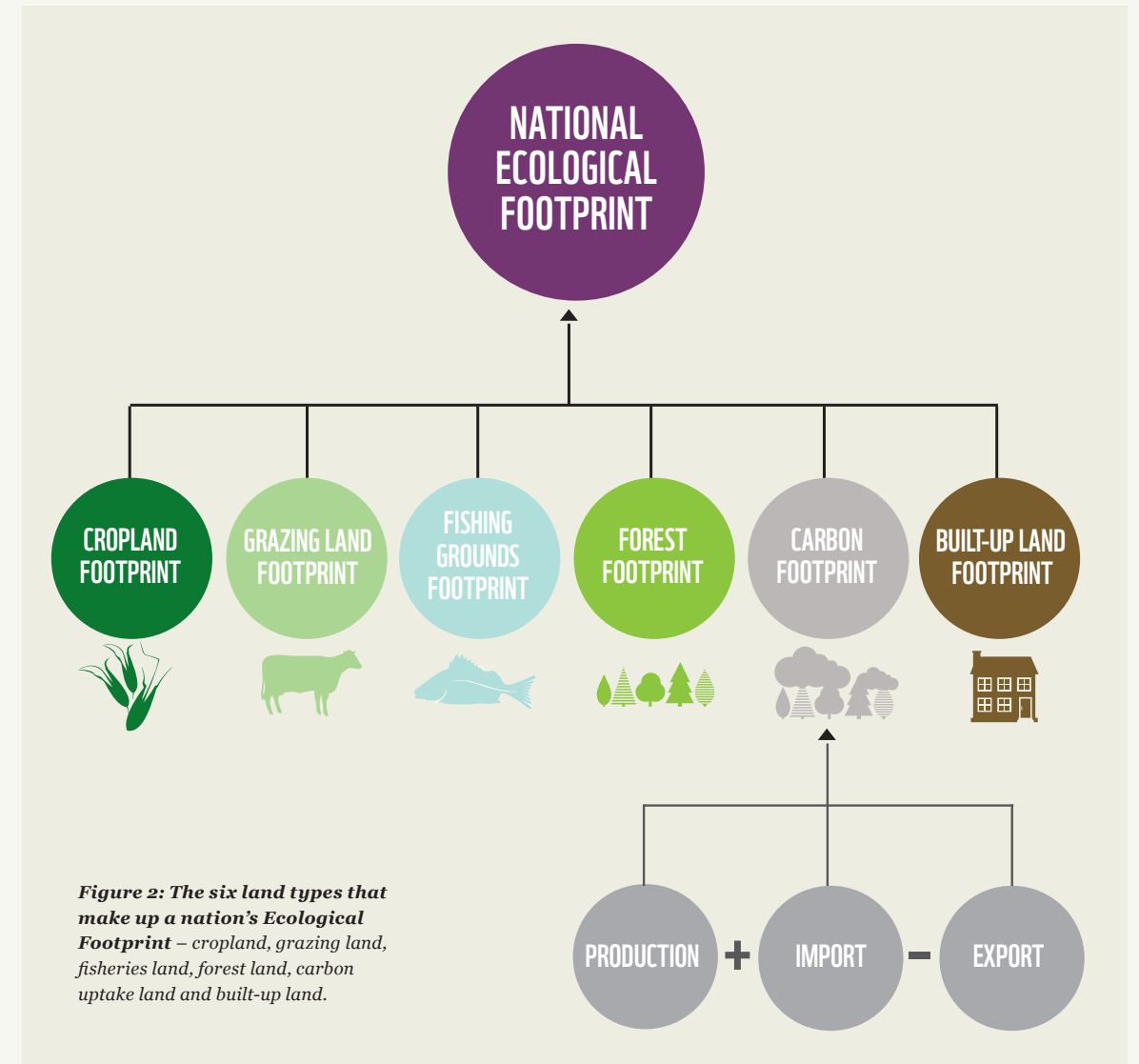


Figure 2: The six land types that make up a nation's Ecological Footprint – cropland, grazing land, fisheries land, forest land, carbon uptake land and built-up land.

A country's Ecological Footprint is the sum of the demand placed on the land types outlined above. More information about land types can be found online at: www.ecologicalfootprint.heroesoftheuae.ae



THE UAE AND ITS ECOLOGICAL FOOTPRINT

3.2

After a long period of extraordinary development and economic growth largely due to the capitalization of oil and gas resources, the population of the UAE enjoys a very high GDP per capita. The country has a desert ecosystem and limited natural resources, yet its consumption of natural resources, both local and imported, is increasing rapidly. With its hot, dry climate, the UAE requires substantial quantities of energy for cooling and for the desalination of seawater for domestic water supplies. Meanwhile, increased spending power has brought greater capacity and demand for importing products and other natural resources from abroad. As a result, around 80% of the UAE's EF is a result of its consumption of energy (the carbon uptake land component, or 'Carbon Footprint'), (LPR, 2006).

In the 2006 *Living Planet Report*, the UAE ranked as the country with the highest per capita Ecological Footprint in the world, based on 2003 data.

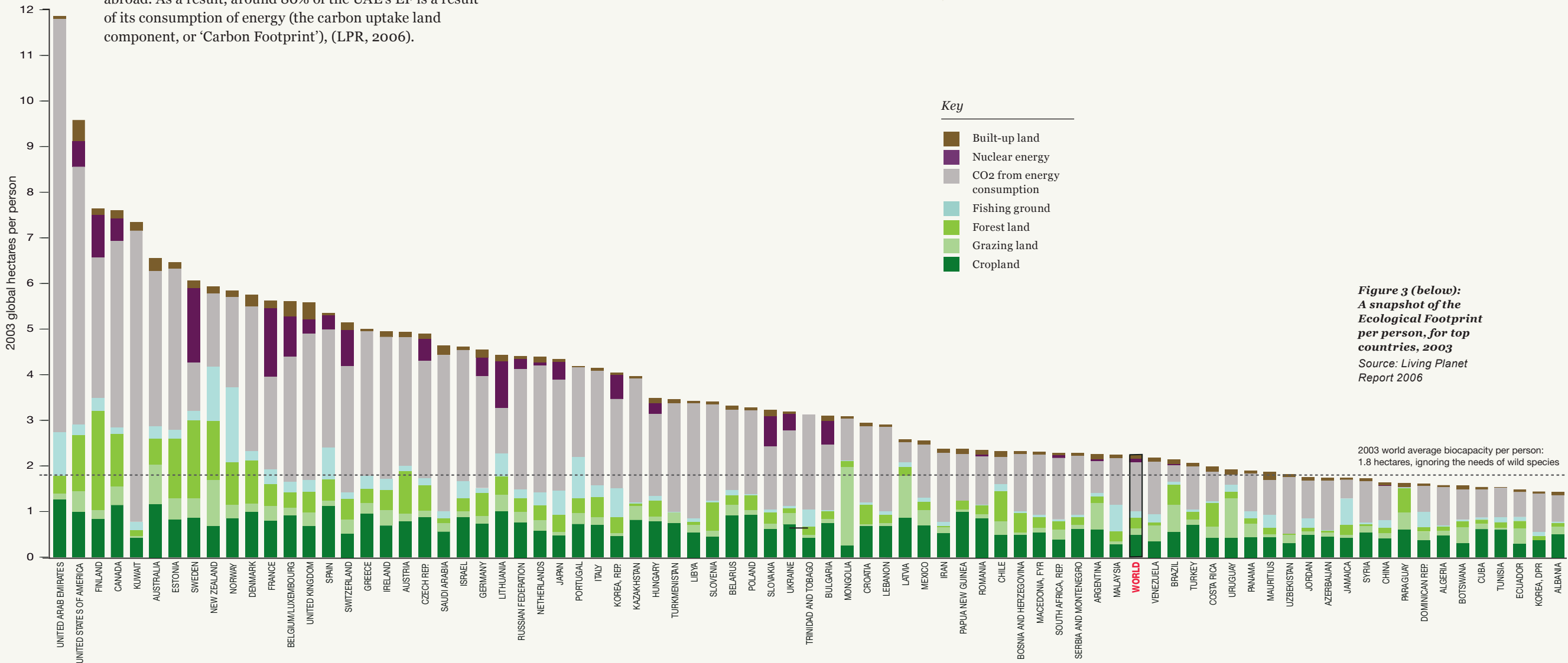


Figure 3 (below): A snapshot of the Ecological Footprint per person, for top countries, 2003. Source: Living Planet Report 2006

The 2006 *Living Planet Report* brought global attention to the UAE and raised serious concerns among UAE government authorities, leading to a meeting in Abu Dhabi in early 2007 with high-level representation from Dubai, Sharjah, Ras Al Khaimah and Abu Dhabi, as well as from WWF International, EWS-WWF and the Global Footprint Network (GFN).

The meeting achieved high-level acknowledgment of the need for robust environmental and socioeconomic data for the UAE, and for an effective mechanism to communicate representative data on the UAE internationally.

It was understood that this would require all national or international studies (and not just sustainability studies such as the EFI) to use comprehensive, officially communicated data on the UAE.

It was seen as important to carry out a thorough investigation into the reliability of the EF as an indicator, but there was also an acknowledgement that, whatever the outcome, the country needed to better understand and more closely monitor its consumption patterns in order to devise strategic policies to pro-actively manage its consumption of natural resources.

As a result, in September 2007 the UAE launched its EFI, made up of experts from MOEW, AGEDI, EWS-WWF and the GFN, to evaluate data, advance research, build in-country capacity, and inform sustainable development policies for the betterment of UAE society and the world as a whole.

THE EFI PARTNERSHIP

IS MADE UP OF MOEW, AGEDI,
EWS-WWF AND THE GFN



CH.4

THE UAE'S ECOLOGICAL FOOTPRINT INITIATIVE

The UAE's EFI has taken great strides to facilitate the government in promoting sustainable lifestyles and ultimately reducing the country's Ecological Footprint. This report outlines the story of the EFI, its achievements, and the key conclusions and recommendations that resulted from the collaborative efforts of the research team and various stakeholder organizations involved.

4.1

ECOLOGICAL FOOTPRINT INITIATIVE GOALS AND HOW THEY ARE BEING PURSUED

The main goals of the initiative were to work towards understanding what the Footprint is, determine the sectors driving the high Footprint, and develop strategies to manage it effectively.

The EFI's mission statement, "A national effort to ensure a sustainable future by measuring and understanding the impact of our ways of living on planet earth", was supported by a set of clearly defined objectives:

- **Sourcing** data integrity
- **Conducting** nation-specific research
- **Contributing** to methodological improvements
- **Fostering** capacity building
- **Recommending and assisting** in the development of policies
- **Raising awareness** amongst all sectors of society

To achieve its mission and ensure access to advice, information and resources, the EFI set up an active and well-managed governance structure that included a steering committee chaired by HE Dr Rashid Bin Fahed, the Minister of Environment and Water. This was instrumental in ensuring that the EFI's accomplishments were received and considered by the various stakeholders.

ACCOMPLISHMENTS OF THE UAE'S ECOLOGICAL FOOTPRINT INITIATIVE

Over the past three years, the EFI partnership has worked to assist the UAE government and civil society to build capacity, undertake cutting-edge sustainability research and take direct action in support of reducing the country's EF and tackling climate change.

In **year one**, the EFI focused on evaluating the usefulness of the EF indicator and its representativeness of the UAE context. This was done through data and methodology reviews with special focus on the population, the carbon Footprint, and the fisheries land type. The EFI concluded that the Footprint is in fact a useful representative tool for the UAE and can be used to derive relevant scientific insights.

In **year two**, the EFI developed significant relevant scientific knowledge, including identifying the major Footprint-driving sectors. Analysis found that UAE households are the greatest contributors to the UAE's EF, comprising 57%, followed by the business/industry and government sectors with 30% and 12% respectively.

In **year three**, the EFI continued its research through the development of an electricity and water scenario model designed to show how the development of the power and water sector might affect the UAE's EF up to 2030, and to help build lower-Footprint alternative scenarios.

The model was developed to assist the UAE government in designing policy portfolios that would result in long-term meaningful reduction in the country's Ecological Footprint.

SCIENTIFIC ACCOMPLISHMENTS

5.1

YEAR ONE

In year one, the EFI's focus was on conducting in-depth data sourcing and analysis in order to evaluate the scope and representativeness of the EF value calculated in the *Living Planet Report*, along with determining the applicability of the EF as an evaluative tool.

The land categories that made up the Ecological Footprint for 2005 are outlined in **Figure 4**, which is a snapshot of the pressure placed by UAE residents on the Earth's various ecosystems and natural resources. The UAE's carbon Footprint component was a key driver in the high UAE results, comprising 83% of the overall Footprint (WWF, 2008).

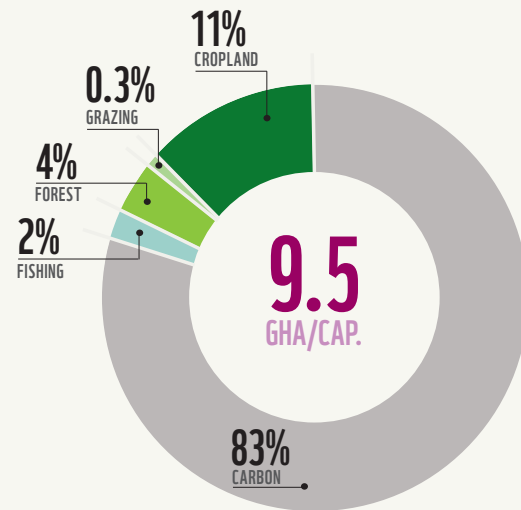


Figure 4: UAE Ecological Footprint by land type, 2005
Source: *Al Basma Al Beeiya Brochure, EWS-WWF, 2010*

The focus for data review and verification was on the Carbon Footprint, Fishing Grounds, Population, and Trade figures used in the 2008 *Living Planet Report*. The table below summarizes the EFI's findings.

RESEARCH	IMPORTANCE	FINDINGS	RECOMMENDATIONS
1 POPULATION	The overall Footprint of a nation is calculated through two key variables – its population and its per capita EF (the sum of individual Footprints for all land types)	<ul style="list-style-type: none"> For 2003, international statistics did not adequately represent the population of the UAE The UAE population census needs greater federal coordination to ensure numbers and methodologies are comparable across all emirates 	<ul style="list-style-type: none"> Establish a National Statistics Bureau to communicate internationally on UAE statistics and prevent any further discrepancy between national and international sources. This was implemented in 2009, thanks in part to EFI recommendations Population figures used for the 2009 National Footprint Accounts (NFA) and 2010 LPR sourced by the UAE research team and endorsed by MOEW
2 TRADE	A proportion of the UAE's Footprint is due to trade	<ul style="list-style-type: none"> Trade was not accounted for in the 2006 LPR due to an inconsistency in the coding used by UAE to report trade flows (HS2003) and that used by the GFN in pulling the data from UN COMTRADE (SITC Rev 1) (<i>Al Basma Al Beeiya Initiative Technical Report – Year 1, 2008</i>) Data gaps were found for imports and exports in the free-trade zones and the quantity of petroleum exported, leading to misinterpretation of the net consumption of the country Lack of data documented for the re-exportation of goods 	<ul style="list-style-type: none"> The GFN should use the most updated trade code system The UAE must account for all trade in the country, and include trade movements into and from free zones in its official national trade statistics
3 CARBON FOOTPRINT	Carbon Footprint represents the majority of the UAE Footprint	<ul style="list-style-type: none"> The 2005 UAE CO₂ data used by the GFN and drawn from the International Energy Agency (IEA) were estimates, based on 1998 and 2001 UAE data (IEA, 2004-2005) There is currently no official 2005 data on local CO₂ emissions available in the UAE 	<ul style="list-style-type: none"> The need for a regularly updated greenhouse gas inventory for the UAE
4 FISHERIES LAND TYPE	The UAE's total biocapacity is largely accounted for by the fisheries land type. Understanding the real impact of the UAE population on fisheries is fundamental for the long-term management of this resource	<ul style="list-style-type: none"> The estimated Footprint of consumption for 2005 used in the 2008 LPR is 46% lower than the original published figure of 2005 	<ul style="list-style-type: none"> Enhance the fishing land Footprint methodology in order to capture a more representative fishing land Footprint for the UAE
5 OTHER LAND TYPES	Review of the remaining land types (crop, grazing, forest and built-up land) to build full confidence in the overall national Footprint value	<ul style="list-style-type: none"> In review of the built-up land, it was recognized that as most of the urban infrastructure in the UAE has been built on desert landscapes with very low biocapacity, the land type was not applicable for the country 	<ul style="list-style-type: none"> Remove built-up land from Footprint calculations for the UAE. The LPR 2008 quantified the UAE's built-up land Footprint as zero

YEAR TWO

Once the UAE's EF value was established as a representative and useful indicator, the next step was to develop greater knowledge of key Footprint-driving sectors. This was accomplished by applying the Environmentally Extended Input-Output Analysis method, where researchers were able to break down the UAE's 2005 EF and identify Footprint 'hotspots'.

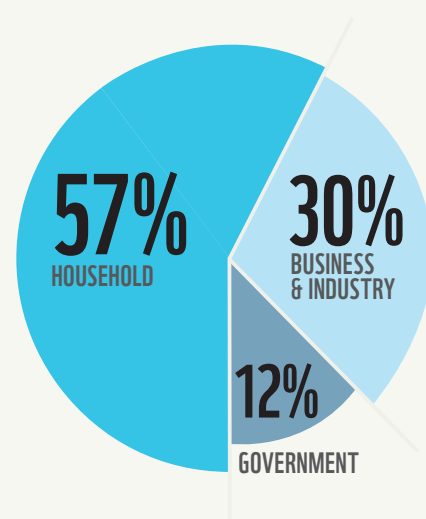
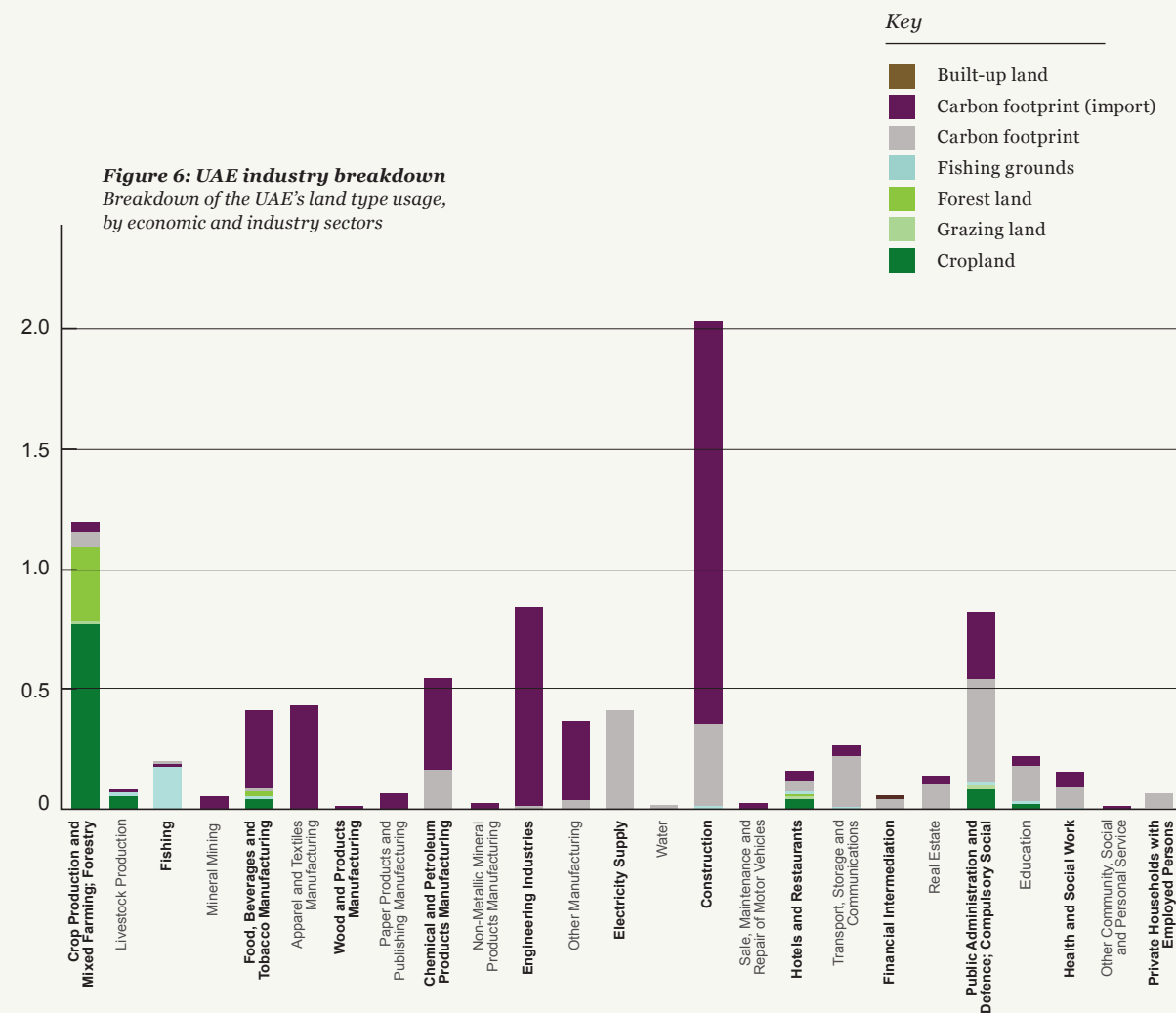


Figure 5: UAE Footprint by demand sector
Contribution to the UAE's Footprint by the three main EF-driving sectors

Due to the high contribution of households to the EF, it was decided that immediate action should be taken to inform UAE households on how to reduce it. This led to the development, in collaboration with EAD and EWS-WWF, of the Heroes of the UAE campaign, aimed at raising awareness about the Footprint, climate change, and how these issues can be tackled via water and energy conservation.

HEROES OF THE UAE

CAMPAIGN AIMED AT RAISING AWARENESS ON ENERGY AND WATER CONSERVATION



The EFI also managed to break down the contribution of each of the main industrial sectors of the UAE economy, identifying the industries that contribute most to the Footprint by land type and so informing what policies and initiatives would have the greatest impact on managing it.



This research has been useful in identifying the industries that require policies to improve their efficiency and reduce their demand for natural resources. The analyses identified construction as the sector with the highest EF, which was mainly carbon-related due to its use of electricity and imported materials.

Finally, household Footprint was broken down by daily activities (eg, Food, Mobility, Housing, Goods and Services) through the use of a consumption land-use matrix (CLUM).

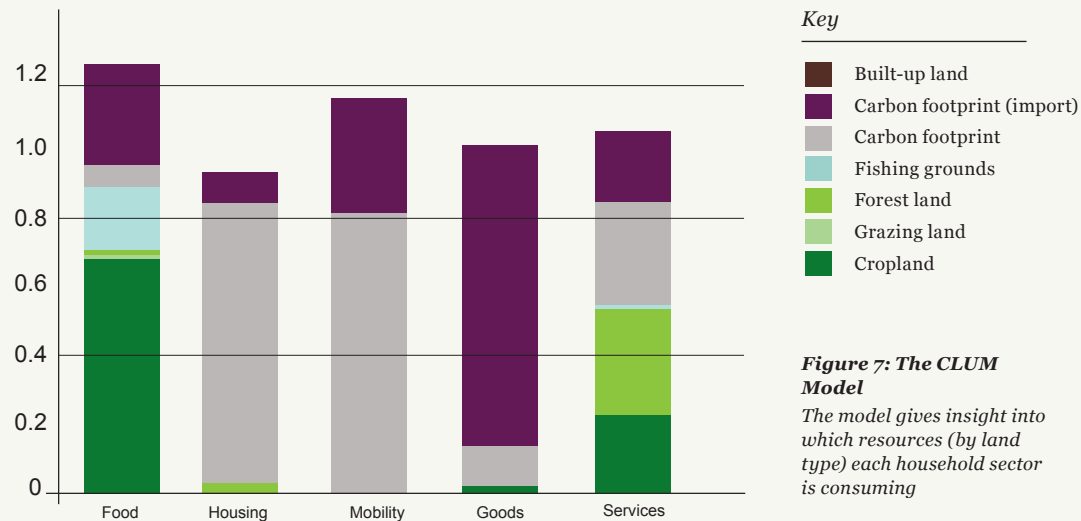


Figure 7: The CLUM Model
The model gives insight into which resources (by land type) each household sector is consuming

The analysis shows that Food and Mobility contributed the most to the demand for resources by households in the UAE (23% and 21% respectively), followed by Services (20%), Goods (19%) and Housing (17%). For each of these, carbon Footprint was found to be the most demanded land type.

This research and verification phase was useful in identifying UAE Footprint hotspots and mitigation opportunities in terms of sectors in which decisions shall be made and key activities that are causing the greatest concern. However, if these issues are to be tackled effectively, it must also be at a policy level. For the EF indicator to be used as a policy driver and assist with targeted policy development, more in-depth research into the various sectors was needed.

FOOD AND MOBILITY ACTIVITIES CONTRIBUTED THE MOST TO FOOTPRINT OF HOUSEHOLDS IN THE UAE

YEAR THREE

83%
OF THE COUNTRY'S EF IS MADE UP OF ITS CARBON FOOTPRINT (ACCORDING TO LPR 2008)

As well as understanding the finer details of the country's consumption patterns, it was also important to study the projected future effect on the EF of various environmental policies. This led to the realization that decision-makers could benefit from understanding what the future EF would be if the country were to continue as usual, as well as how it could potentially change through new policies and other development plans. This cutting-edge research allows government leaders to visualize how their development plans and strategies for policy implementation would affect the environment in the future.

Thus, researchers from EWS-WWF and the Masdar Institute, supported by the GFN, led the development of a science-based scenario modeling tool (the Ecological Footprint Scenario Model, or EFSM) to assess the impact of existing and more ambitious policies around CO₂ emissions and the EF up to the year 2030.

SCENARIO MODELLING TOOL DEVELOPED TO ASSESS THE IMPACT OF POLICIES ON ABU DHABI'S CO₂ EMISSIONS AND ECOLOGICAL FOOTPRINT UP TO 2030

Abu Dhabi was selected as a case study due to data availability and its large-scale development plans that have a potential impact on the EF of the country as a whole. As more than 80% of the UAE's Footprint is carbon related (LPR, 2008), the research focused on creating a reliable methodology and tool to evaluate policies targeted at reducing CO₂ emissions and hence the carbon Footprint of Abu Dhabi's power and water sector. Energy and water are intricately linked in the UAE, as they are largely co-generated in the same power plants. It was determined that the EF scenario model would focus on the power sector as a whole due to its large Carbon Footprint contribution, and policies to reduce it would tackle the demand and supply of both electricity and water. An overview of the policies considered in the model is shown in **Figure 10** (see page 27).

The model can assess the impact of a single policy or a combination of policies and project the potential reductions in the UAE's per capita Footprint by the year 2030 compared to a business-as-usual (BAU) scenario. Ultimately the aim is to expand the assessment for the whole country and to generate useful, relevant and robust science-based policies that government leaders can implement to make the UAE economy more sustainable. While data availability limited this exercise to Abu Dhabi, additional efforts should be put in place for the collection of data needed to extend the exercise to the national level.

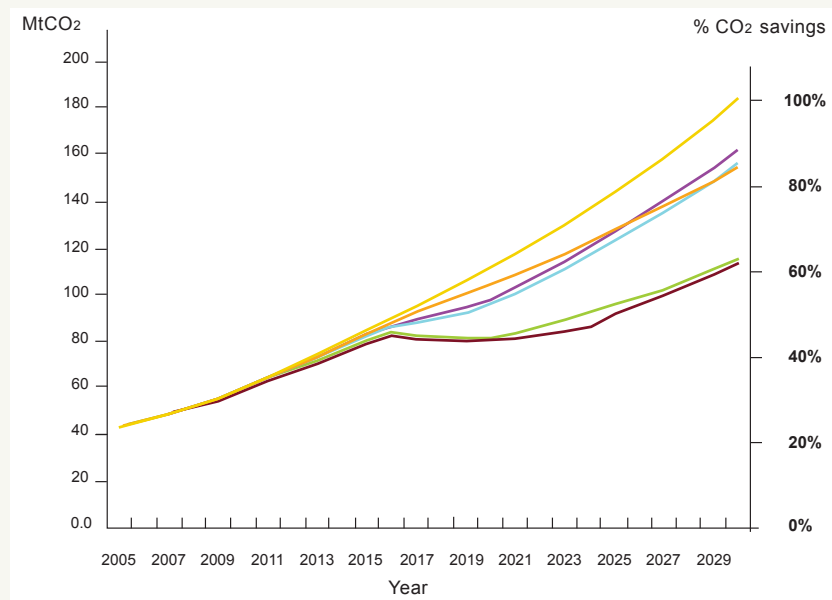
The technical work of the model has been extensively informed by a comprehensive stakeholder-consultation process for which key technical experts and governmental policymakers provide input, data and expertise. The current EFSM model is only an alpha-stage model that can provide science-based insights to policymakers on what policies would be most effective in reducing the carbon Footprint of Abu Dhabi and the UAE as a whole. The model can be made more relevant and robust through improvements in its data sets. To complete a holistic policy design, it is necessary to expand the model to incorporate the direct costing of policies and evaluate socioeconomic impacts.

An overview of the policies considered to tackle the demand and supply of electricity and water are shown on page 27:

In order to compare the relative effectiveness of the different policies over time, a BAU scenario was generated. **Figures 8 and 9** show a few hypothetical scenarios comprising a combination of policies implemented in 2010 and their projected impact in the period up to 2030 (Ecological Footprint scenario model, 2010). More ambitious policies result in greater carbon emissions and Footprint savings. In order to interpret the data correctly, it should be borne in mind that the EF has been calculated as an average for the entire UAE while the policies are assumed to be implemented in Abu Dhabi only. If the policies were extended to the other emirates, their impact on the EF would be significantly higher. It should also be noted that the Footprint scenarios were calculated without considering the additional demand for other land types that such CO2 reduction could cause.

Figure 8: Hypothetical scenarios for Abu Dhabi's CO2 emissions
Percentage reduction of Abu Dhabi's CO2 emissions for five hypothetical scenarios compared to the baseline (2005-2030)

- Key**
- Business as usual
 - Scenario A
 - Scenario B
 - Scenario C
 - Scenario D
 - Scenario E



Scenario definitions for Figures 8 and 9

SCENARIO A	SCENARIO B	SCENARIO C
<ul style="list-style-type: none"> Four nuclear power plants by 2021 15% renewable energy by 2020 10% carbon capture and sequestration by 2030 	<ul style="list-style-type: none"> 200% increase in electricity tariff Four nuclear power plants by 2021 15% renewable energy by 2020 10% carbon capture and sequestration by 2030 	<ul style="list-style-type: none"> Indoor and outdoor water equipment standard 100% TSE reuse by 2030 Installation of 13 reverse osmosis (RO) plants by 2018-2030
SCENARIO D	SCENARIO E	
<ul style="list-style-type: none"> 200% increase in electricity and water tariff by 2030 50% electric vehicle penetration by 2030 Four nuclear power plants by 2021 15% renewable energy by 2020 10% carbon capture and sequestration by 2030 100% TSE reuse by 2030 	<ul style="list-style-type: none"> Strong building envelope standard with 60% reduction in cooling demand High-end electrical equipment standard Indoor and outdoor water equipment standard Four nuclear power plants by 2021 15% renewable energy by 2020 10% carbon capture and sequestration by 2030 100% TSE reuse by 2030 Installation of 13 RO plants by 2018-2030 	

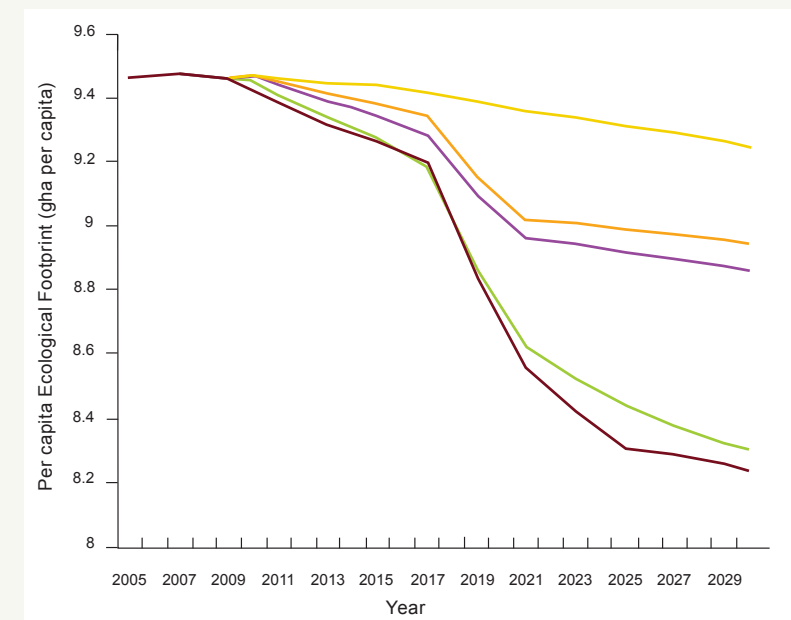


Figure 9: Hypothetical scenarios for the UAE's Ecological Footprint
Reduction in the UAE's Ecological Footprint per capita for hypothetical scenarios compared to the BAU baseline (2005-2030)

- Key**
- Business as usual
 - Scenario A
 - Scenario B
 - Scenario D
 - Scenario E

Listed below are details on Scenarios A, C and E from the figures and their impacts on UAE footprint:

SCENARIO A

Scenario A illustrates that the emirate of Abu Dhabi could reduce its CO2 emissions by 12% and achieve Footprint reductions of about 0.5 gha per capita by 2030 by implementing the following policies:

- Four nuclear power plants of capacity 1.45 GW by 2021
- 15% renewable energy capacity by 2020
- 10% carbon capture and sequestration by 2030

SCENARIO C

Scenario C shows that the following combination of policies aimed at just the water sector could achieve a 16% CO2 emissions reduction for 2030:

- Outdoor water equipment standard
- 100% TSE reuse by 2030 and reverse osmosis (RO) through the installation of 13 desalination plants of 60MG each between 2018-2030.
- Increase in RO capacity

SCENARIO E

Scenario E illustrates that Abu Dhabi could potentially reduce its own CO2 emissions by 2030 by up to 40% and the UAE's overall per capita Footprint by 1 gha by implementing the following combination of policies:

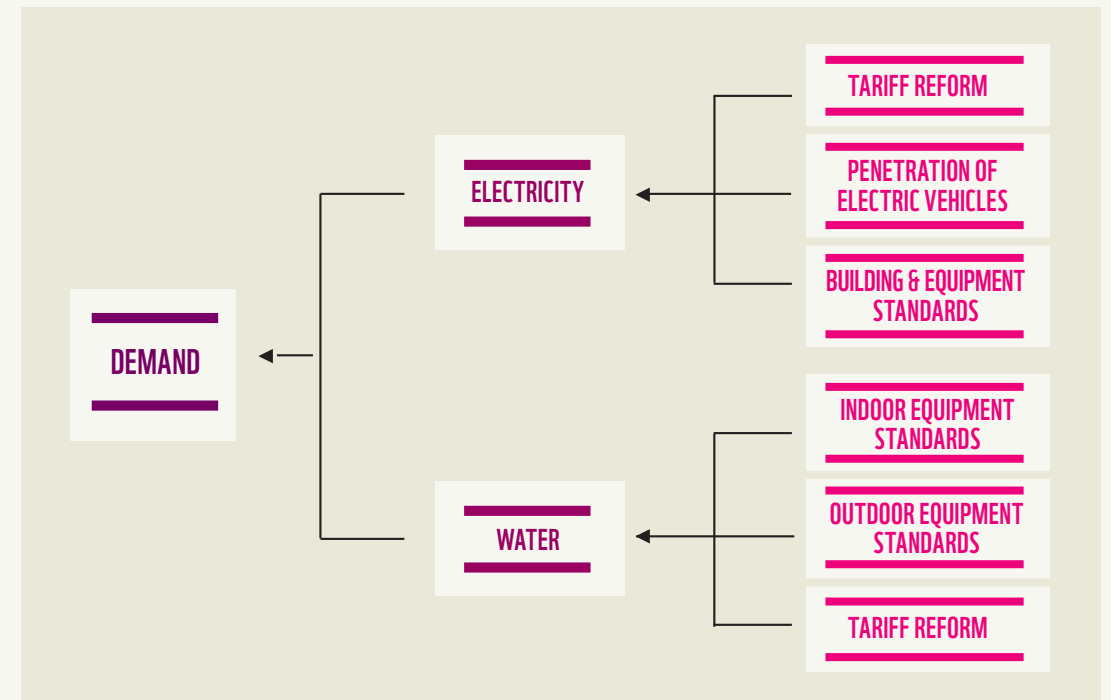
- Strong building envelope standard with a 60% reduction in cooling demand through enhanced insulation
- High-end electricity equipment standard
- Water equipment standard for indoor (faucets, showers, toilets, washing machines, etc) and outdoor (micro-irrigation system, dripping system, reclaim system, etc) equipment
- Four nuclear power plants of 1.45 GW capacity each by 2021
- 15% renewable energy capacity by 2020
- 10% carbon capture and sequestration by 2030
- 100% treated sewage effluent (TSE) reuse by 2030 and reverse osmosis (RO) through the installation of 13 desalination plants of 60MG each between 2018 and 2030

The currently planned government policy is to have 7% renewable capacity plus four 1.5 GW nuclear power plants by 2020, which will result in a CO2 reduction of less than 8% and consequently lower than the above hypothetical scenarios.

This in-depth research should allow government leaders to address the areas that are of most concern in the UAE and therefore achieve the greatest impact.

It was important for the EFI to provide this information in order to facilitate effective targeted policy development. In developing the first stage of the model, the cooperation of key stakeholders has been crucial. Continued support and engagement from government and private stakeholder agencies, through the provision of data and expert feedback, will again be a critical factor for extended work.

Demand side measures



Supply side measures

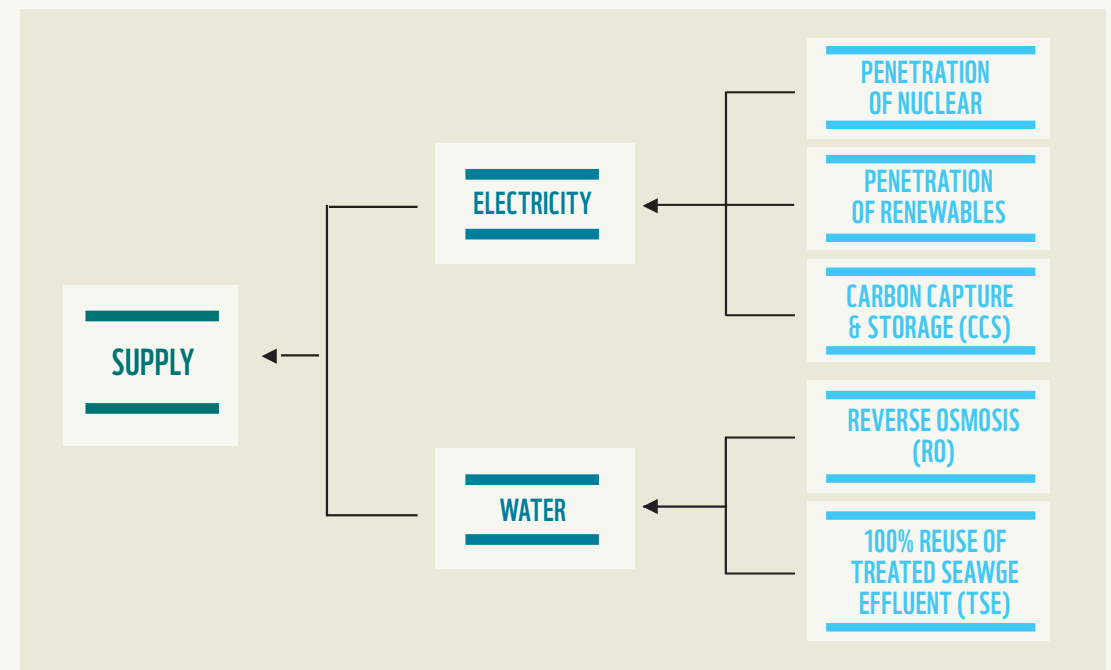


Figure 10: Overview of policies assessed in the scenario model for energy and water

COMMUNICATIONS AND CAPACITY BUILDING

It was understood early on that as well as facilitating the development of policies, the EFI needed to incorporate a grassroots approach and raise awareness about the issue in all sectors of society in order to motivate behavioral change and prepare UAE residents for policy changes that might occur. Another core objective has been capacity building on the Footprint concept, and the EFI has achieved a number of accomplishments in this regard.

6.1 ECOLOGICAL FOOTPRINT EDUCATION AND CAPACITY BUILDING

As the majority of the UAE population is transient, with very few Emirati nationals working in the field of sustainability, it was necessary to actively engage Emirati researchers in the work, in order for them to gain in-country expertise and be able to further scientific developments.

To this end, a research team was assembled to assist with the research and science objectives of the initiative. The team comprised mid-level staff with various skill sets from different organizations (*see Figure 11*).



Figure 11: Research team overview

In 2009, a 12-month agreement was signed with the Masdar Institute for collaborative efforts towards further in-house capacity development as well as policy analysis and formulation using EF science. Furthermore, the UAE’s EFI called for the assistance of other in-country expertise, including the EAD’s Biodiversity Sector and Zayed University’s Economic Policy Research Unit, for better comprehension of fisheries and socioeconomic data acquired for the EFI’s research, respectively.

Capacity building took place through technical training in the government and private sectors, as well as an intensive government-engagement strategy for mid-level staff that included a series of workshops on the EF and climate change. The EFI also conducted important formal and informal engagements with research institutes, universities and other higher education bodies, with the aim of educating students and future leaders of the country on EF science.



The EFI placed an Emirati student intern from American University of Sharjah (AUS) and a trainee on secondment from EAD within its research and communication teams. Upon completion of her undergraduate studies, the AUS intern was hired as full-time coordinator of the UAE EFI with EWS-WWF. Meanwhile, the EAD trainee has made advancements to assume sustainability accounting within EAD facilitating the work on the Environment 2030 vision and continuing work at EWS-WWF.

The Heroes of the UAE campaign, along with the EFI, developed a “lead-by-example” program motivating government agencies to conduct ‘green makeovers’ for their offices, as well as workshops on the underlying environmental issues to ensure that staff members were actively engaged in reducing their EF. The first case study was completed in April 2010 for the MOEW offices. The building underwent technical changes predicted to reduce its water consumption by 44% and its carbon Footprint associated with energy consumption by up to 24%; the impact is being monitored from April 2010-2011. A staff engagement workshop raised awareness about the EF and climate change and motivated behavior change from ministry employees. Other workshops were organized with ministries and government agencies, the Family Development Foundation and other organizations.

The remarkable speed by which capacity has been built is a reason to congratulate the stakeholders and their advisors who participated. The EFI has brought about great change in the understanding and acceptance of the EF in the media and among stakeholders, indicating that considerable capacity is indeed being built in the country. High-level support and communication with decision-makers was enhanced through the incorporation of the EFI in various government reports including the EAD *State of the Environment* report (SOE), the UAE’s 2nd national communication to the United Nations Framework Convention on Climate Change and the EAD *Environment 2030* work.

ECOLOGICAL FOOTPRINT WEBSITE AND ANIMATION

A suite of communication tools was developed for the EFI to educate the public on the issue of consumption patterns and disseminate EF science. An EF animation and a website (www.ecologicalfootprint.heroesoftheuae.ae) were developed in English and Arabic as awareness-raising tools to inform people from all parts of society and inspire them to rethink their consumption choices.

The EF website uses interactive visual communication tools to raise awareness of the EF concept and its relation to the UAE, providing information on how the EF is calculated for a certain product, a product's environmental cost, and how the indicator works overall.

The beautifully designed animation was developed out of recycled newspaper and set as a 'day in the life' of a typical Emirati, showing the environmental implications of his actions and choices. The aim of this project was to illustrate, in a way that would appeal to the multicultural population in the UAE, the scarcity of natural resources and the need to live within our resources to ensure a healthy life for future generations. The animation was very well received in cinemas across the UAE and nominated for various film awards including the EFFIE award, the Green award and the BAF award.



INTERNATIONAL EXPOSURE

The UAE's EFI receives increasing recognition locally, regionally and internationally for its implementation, communication strategy and technical advancements. This increased public profile has generated interest from countries looking to replicate and/or learn from its governance structure and work achievements. The EFI's research team was invited to present its findings at the following conferences:

- **IUCN World Conservation Forum**, Barcelona, Spain, October 2008. A GFN-organized open discussion on 'Linking Human Well-Being and Biological Capital'
- **4th World Information Technology Forum**, Hanoi, Vietnam, August 2009
- **WWF Global Energy Policy meeting**, New Delhi, India, February 2010
- **Footprint Forum**, Siena, Italy, June 2010
- **EU-GCC Clean Energy Network**, Dubai, UAE, November 2010

The UAE's EFI also received expressions of interest in its experience from Kuwait and Qatar, as the countries are currently working on implementing their own national initiatives.

The EFI had the 2010 *Living Planet Report* translated into Arabic in order for it to reach a larger audience. It also developed an insert on the UAE Initiative as a case study of how the issue is being addressed here.





HEROES OF THE UAE

6.4

To achieve a holistic communication strategy on the Ecological Footprint, a top-down and a bottom-up approach were implemented. It was necessary to develop an independent unit to set out the information obtained from the EFI in lay terms.

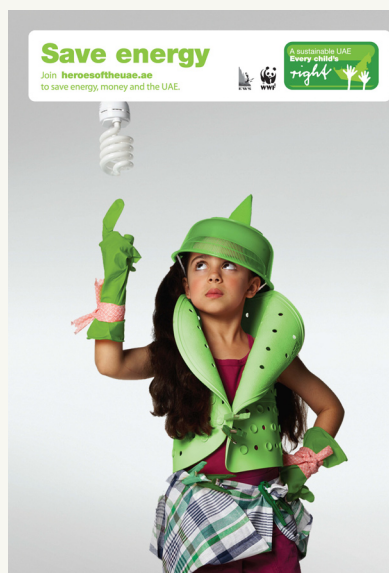
Heroes of the UAE is a sustainable lifestyle campaign that was developed by EWS-WWF along with EAD and launched in February 2009, providing simple tips on how to reduce energy and water consumption in a bid to help tackle the UAE's EF and global climate change. EFI science has allowed the campaign to target the sectors of UAE society that most significantly contribute to the country's large per capita EF: households, schools and the government and private sectors. This science-based communication has provided valuable credibility to the campaign. It has also helped on specific areas to build momentum and achieve positive reductions in the UAE's EF.

Up to 2011, the campaign has achieved several milestones including:

- **Over 60,000 unique visitors to the website and 9,792 pledges** online to reduce energy and water consumption across the UAE
- **Thirty-five companies** have pledged to become Corporate Heroes and reduce CO₂ emissions associated with energy and water consumption by 10% in 12 months and committed themselves to developing a long term strategy to maintain and continue this reduction in the years to come
- **A successful household** electricity carbon calculator
- **A business toolkit** to promote energy and water conservation measures in office spaces that has been downloaded by more than 100 companies
- **An award-winning** educational website: www.heroesoftheuae.ae
- **Outreach activities reaching over 25,000 people**, of whom more than 50% are Emirati
- **Initiation of 14 green makeovers** with schools, businesses, government and households to demonstrate the benefits of energy and water conservation
- **A nationwide quiz** on climate change and an energy water reduction competition, where 125 schools participated

HEROES OF THE UAE

TARGETS HOUSEHOLDS, SCHOOLS AND OTHER SECTORS TO HELP REDUCE THEIR CONSUMPTION OF ENERGY AND WATER



The EF is a useful representative tool for the UAE, but it should be made more policy relevant

CH.7

CONCLUSIONS AND RECOMMENDATIONS

The preceding chapters highlight the innovative and far-reaching achievements of the UAE's EFI.

From a scientific perspective, the UAE EFI has gained extremely valuable insights into not only which sectors are most responsible for the UAE's overconsumption of resources, but also what activities within those sectors contribute to our high EF. The research has also been able to delve into a further level of detail to show the sectors of the economy that these users are demanding from. This provides insights into which resources are being demanded by which users, and therefore where mitigation action is needed.

The EFI also conducted a methodology review of the EF calculation, and concluded that the EF indicator is in fact a representative tool for the UAE and that there is a need for further scientific research into it and its relevance to policy-making. Key recommendations that resulted from the research included the foundation of a national bureau of statistics and a comprehensive and yearly updated greenhouse gas inventory for the country.

In an effort to expand the EF's application for policy assessments and decision-making purposes into the future, the EFI developed an innovative electricity and water scenario model to facilitate more sustainable, lower-Footprint policy development, the first of its kind in the world. The initial model results indicated that through the implementation of a combination of policies aimed at the power sector, CO₂ emissions for Abu Dhabi could be reduced by up to 40% and the UAE's overall per capita EF reduced by 1 gha/person.

From a communications perspective, an exciting achievement has been the translation of the EFI's scientific findings into direct action, as seen in the Sustainable Lifestyles campaign, Heroes of the UAE, co-created and implemented by EWS-WWF and EAD. The campaign brings benefits of greater public awareness of the EF and highlighted the important responsibility of individuals and institutions to address related global issues like climate change by conserving energy and water. The household phase of the campaign has provided a ground-level perspective on the sector that demands 57% of the resources used by the UAE, as well as providing valuable policy insight on public attitudes toward these issues. Another crucial component of the EFI is capacity development.

To this end awareness workshops have been organized and in-depth research studies launched with local institutions, including the Masdar Institute, on the EF's usefulness as a policy tool.

The EFI has developed an interactive website and an award-winning animation that has been marketed both online and at cinemas across the UAE. The EFI's holistic communications approach has succeeded in translating the research into language that can be understood by all. It has been very successful at raising awareness at all levels of society and government.

The EFI also made strong enhancements to capacity in UAE nationals and developed collaborations with UAE academic institutions to foster in-country expertise while establishing its own scientific and technical credibility. It created a research team that included academic experts, government and business representatives, and conducted numerous capacity development and communication activities.

Apart from this, the capitalization of oil wealth, which has contributed substantially to the current standard of living enjoyed by the country's residents, can also play a major role in the transition towards a sustainable society, as the country is able to invest in cleaner technologies. The transition to sustainable energy resources provides an opportunity to address not only the environmental issues that are of concern, but also the economic and development needs of a country that is interested in diversifying its economy. It is crucial for governments and decision-makers both locally and globally to make the transition to sustainable development that ensures living well within the means of nature.

The experiences and knowledge gained from the EFI have benefited the country by creating opportunities for UAE government leaders to work toward sustainable development, as well as paving the way for other countries to follow the UAE's lead. Initiatives aimed at tackling the challenge of sustainable development are crucial, and continued communication and dissemination of knowledge locally, regionally and globally are necessary for the world to make the transition towards a more sustainable economy and way of life.



The Heroes of the UAE campaign has created public awareness of the EFI and reinforced the message of reducing consumption to address global issues such as climate change



Key recommendations have been identified for the long-term success of the UAE EFI. Their implementation will require concerted effort and partnership between government agencies, academia, businesses and civil society or nongovernmental organizations. If implemented in a coordinated manner, these should hopefully lay the foundation for transformative changes for the UAE that will be effective far into the future.

1 Raise awareness about the EF and encourage positive behavioural change

Technological and policy changes will only be successful if complemented by a more fundamental shift towards more sustainable lifestyles in the UAE. The UAE's EF can be more effectively reduced by raising awareness about why it is so high and using innovative communications campaigns to encourage behavioural change. Encouraging a grassroots approach and an open and transparent dialogue with civil society about the issues would help to raise awareness within the general public, the private sector and the government about the country's high consumption patterns and how they can best be tackled. These awareness efforts would be best led by independent entities such as NGOs, but their success would also depend on the support of federal and local government agencies including ministries, municipalities, environment agencies, utility companies and others, as well as businesses and other entities.

2 Engage with UAE policy makers so they can better understand the need for science-based policy work

Whenever research into sustainability issues is conducted, it is important to ensure that it will be relevant to policy makers. This can be done by developing a comprehensive engagement plan with different entities where information is shared and their feedback is sought. This would enable them to acknowledge the research findings and progressively incorporate new scientific accounting applications as they are developed into current and future development plans and strategies.

3 Build in-country capacity in scientific research to inform policymaking and communications

Developing sound science on sustainability will lay the foundations for robust policy making and communications. Working with the best local universities and researchers will also help to develop much needed local capacity in sustainability research such as science-based accounting tools. Linking research to the government's policy agenda can facilitate the practical application of these findings in policy work. A range of local universities can play a crucial role in this work, including (but not limited to) the Masdar Institute of Science and Technology, Zayed University and UAE University. Similarly, working with government agencies on analysis and research will also help to build capacity within them.

4 Communicate about research findings in an open and transparent manner through different strategies targeting press, digital platforms and via outreach activities

There is growing public awareness and concern about issues related to sustainability and climate change. Being able to openly communicate the research findings to the general public (especially universities, schools and businesses) is important for building trust in the work. This can be facilitated through a diverse range of approaches, including concerted public relations and media efforts, online platforms such as websites and social networking sites, and community outreach efforts.

5 Improve data sets and encourage greater sharing and public availability of information

Good research is fundamentally reliant on access to good-quality information. At times it was difficult for the EFI to access the relevant data sets in the UAE to inform the work, as much of the information was either not available or not shared. While many entities did kindly share information with the EFI, for similar work to be successful in the future there will need to be a much greater need for entities to share data and make it more publicly available. This would also help improve the EFI's legitimacy, both locally and internationally.

The establishment of the UAE's Federal Bureau of Statistics by Federal Law 9 of 2009 is a very welcome development. We hope that all relevant statistical authorities from different emirates start a dialogue with this entity to establish its remit and ensure that relevant information is published in a timely manner. Some key data areas that need to be improved upon include: the creation of an up-to-date Greenhouse Gas (GHG) inventory, improved trade data collections, and a comprehensive 2010 UAE population census.

6 Significant EF reductions are possible but will require much more collaboration between government agencies, the private sector and the general public on policy development and implementation

The EFI found that action in the emirate of Abu Dhabi alone could reduce its CO₂ emissions by up to 40% and the UAE's per capita EF by 1 gha per person by 2030. This only focuses on policies tackling the power and water sector, and much greater reductions will be possible if these measures are complemented by similar efforts in the transportation, manufacturing, oil/gas and land-use sectors. Furthermore, the development of a more comprehensive strategy to reduce the UAE's CO₂ emissions and EF will require a concerted effort by all emirates of the UAE.

Policy measures will also need to be prioritized and implemented based on their impact on the EF, the social and economic costs and their political feasibility. Such assessments will require much greater collaboration and coordination between different government agencies working on environment, economics and social welfare, at both federal and local levels. The current work in Abu Dhabi related to the development of the Economic, Environment and Social Visions are good examples that could be replicated in other emirates. Dialogue with the public and private sector on policy development would also help improve the robustness of measures and facilitate implementation.

7 There are many different areas to continue the work of the EFI, which will require further research, communications and collaboration

The EFI has identified a variety of ways in which its work can and should be continued into the future. These include the need to continue building capacity on science-based accounting tools through research on the feasibility of the policy measures identified in year three. This could include researching into the socioeconomic impacts of policies in order to prioritize key measures and then working with government agencies and businesses to design implementation plans. The work can also be continued by improving certain data sets and expanding the scenario modelling analysis to other emirates and economic sectors. Whatever direction is selected, continued support and engagement from private sector entities, through provision of data and feedback, will again be critical to the success of future work.



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