Green Digital Charter
NiCE project toolkit
User Manual

http://www.greendigitalcharter.eu/toolkit

1 Contents

9 City Exchange

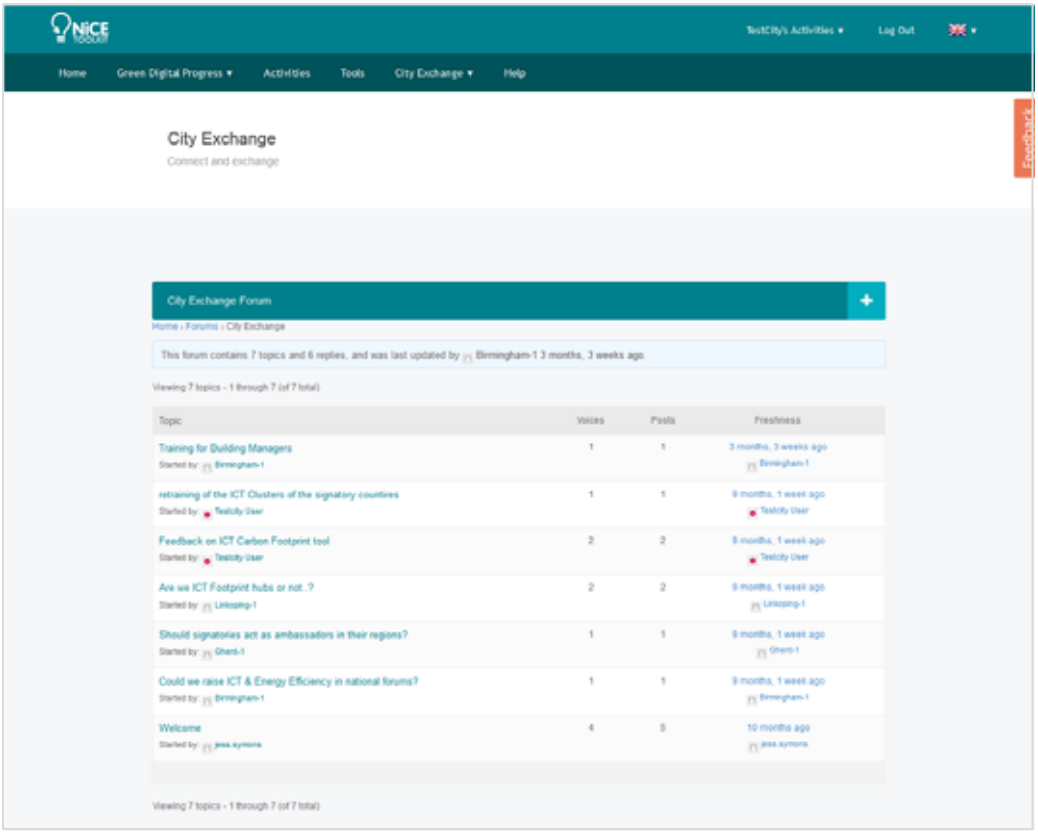
Selecting the City Exchange item from the Main Menu reveals three sub-menu options:

- View City Exchange
- View Developers' Blog
- View All City Snapshot.

City Exchange Menu Expanded

9.1 City Exchange Forum

The City Exchange is a forum where Registered, Authenticated Users can initiate and take part in discussions on matters of interest.



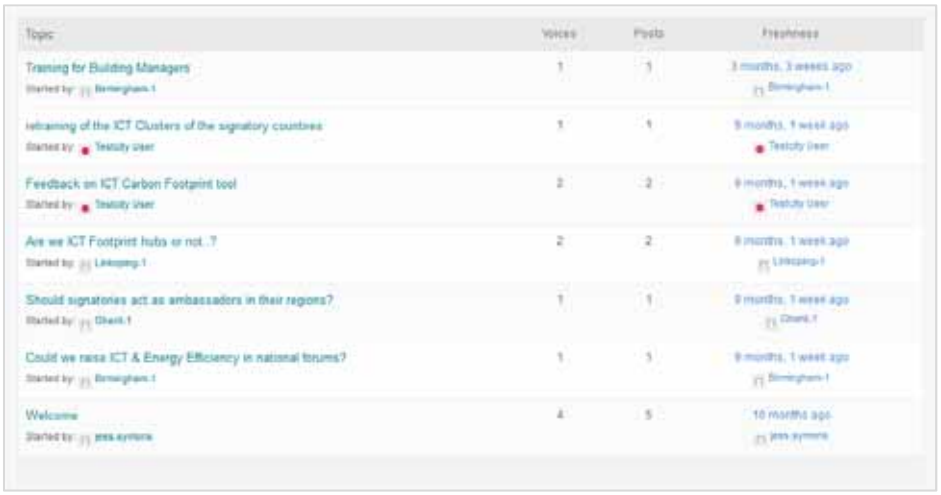
City Exchange Main Page

Unauthenticated users are able to view forum entries but are not able to initiate or comment on topics.

9.1.1 List of Topics

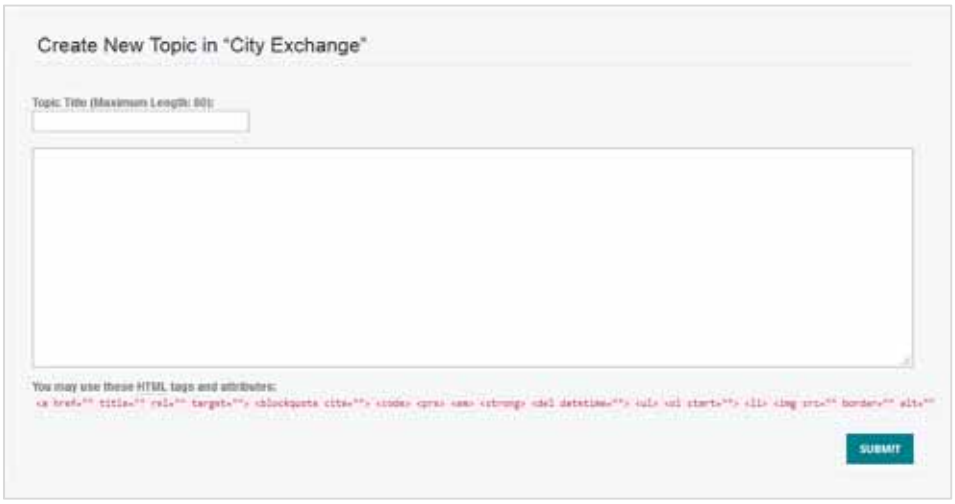
On entry to the City Exchange forum page, the user can view a list of the latest topics of debate, sorted in order of 'freshness', with the freshest at the top.

The columns of the list show the Topic Title (subject), the number of contributors to the Topic's thread of original and subsequent comments, the number of posts in the thread and the Freshness of the thread (how long since the last comment was made).



List of Topics

An Authenticated User may start a new Topic of discussion by entering a Title and general narrative in the "Create new Topic" panel under the list of current topics. The main narrative window accepts use of a limited set of HTML tags for formatting purposes.

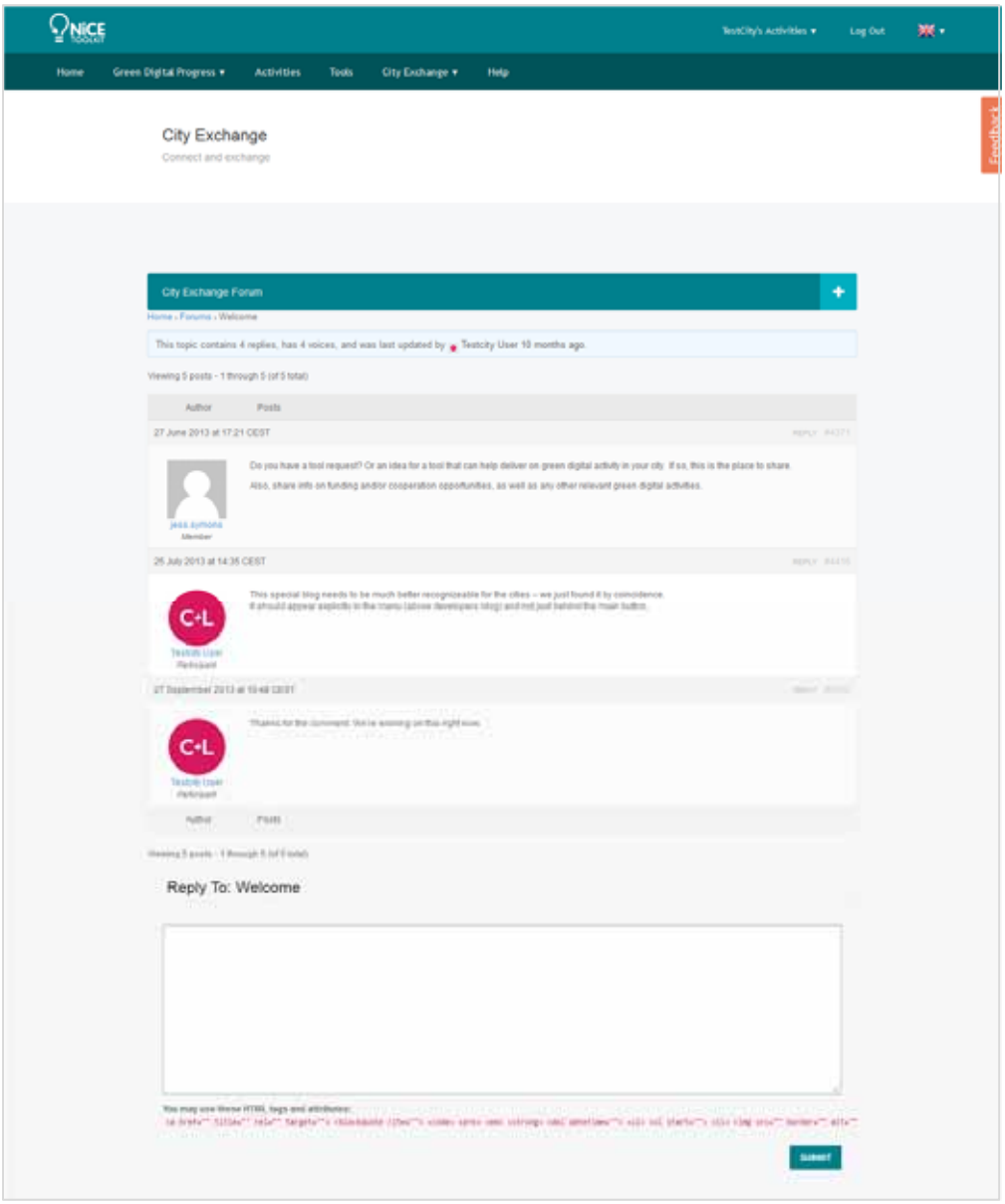


Create a New Topic

Click on the “Submit” button at the bottom right hand corner of the form to publish a new Topic.

9.1.2 Topic Thread

Clicking on a Topic Title in the list of topics will open up the Topic’s thread of initial post plus any comments. The original post is given first, with subsequent comments list in ascending date/time order below.



Topic Thread Page

An Authenticated User may enter a new comment or Reply to a Topic of discussion by entering general narrative in the “Reply To:” panel under the list of comments. The narrative window accepts use of a limited set of HTML tags for formatting purposes.

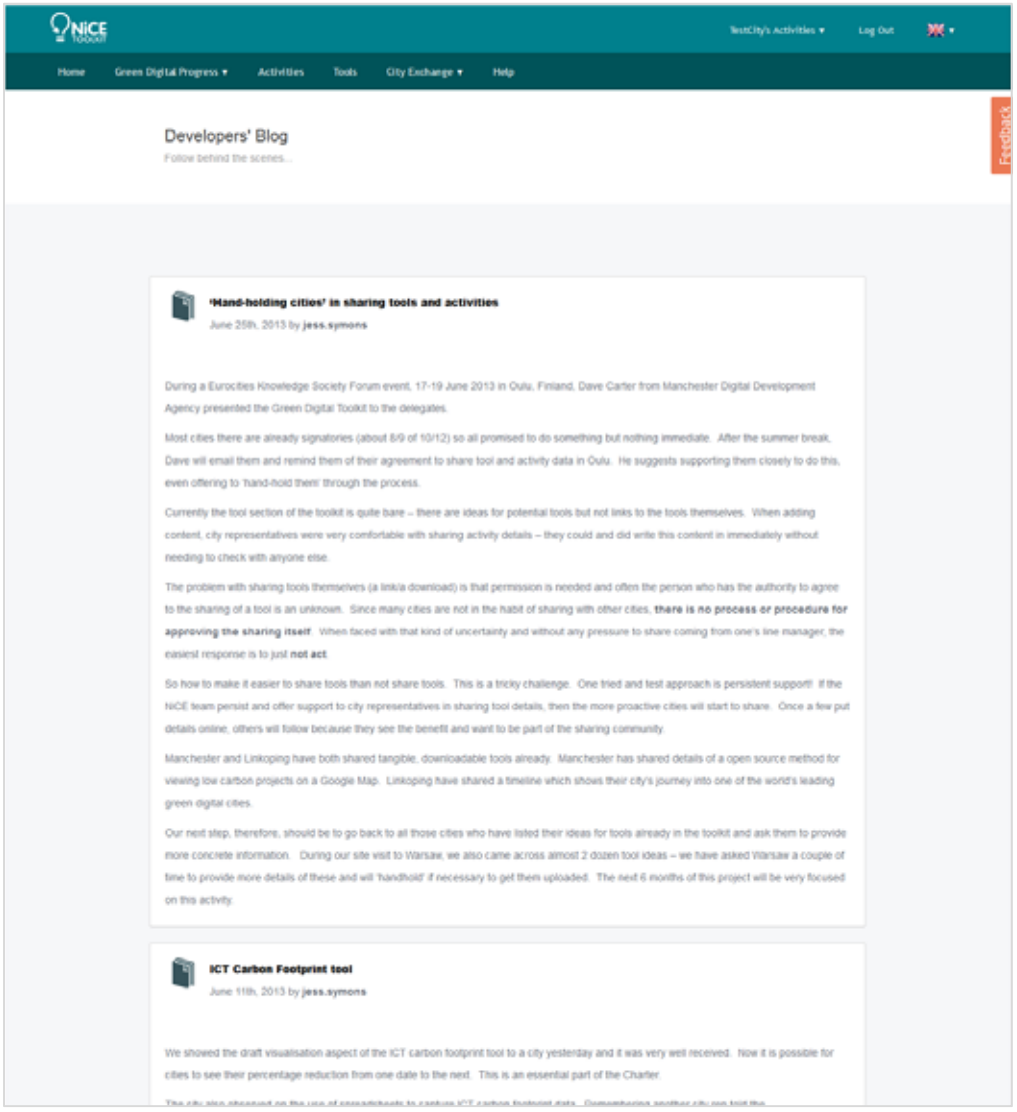
Click on the “Submit” button at the bottom right hand corner of the form to publish a new Reply.

A return to the main Forum page can be made by using the browser’s ‘back’ button or by reselecting City Exchange > View City Exchange from the Main Menu.

The breadcrumb trail at the top of the forum or topic panels is intended for visual reference purposes only and its use for navigation between pages is not recommended.

9.2 Developers' Blog

The Developers’ Blog is a means for the Toolkit developers to make announcements about the development of the NiCE Toolkit, such as new or updated features.



Developers’ Blog Page

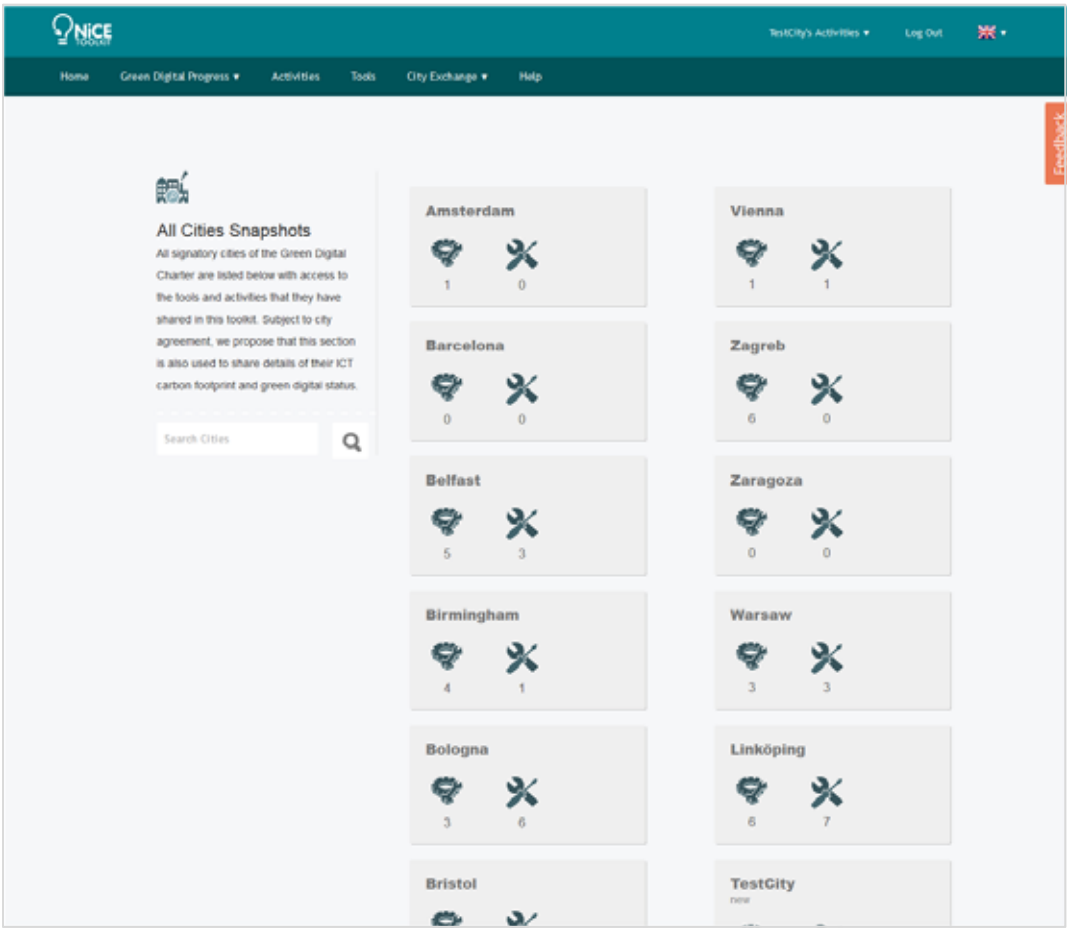
Blog entries are listed in their entirety, with the latest blog entry at the top of the page. Older blog entries are listed in descending order of posting date.

It is not possible to comment on a blog entry in the Developers' Blog

Any discussion on the Toolkit and its development can take place in the City Exchange forum.

9.3 All Cities Snapshot

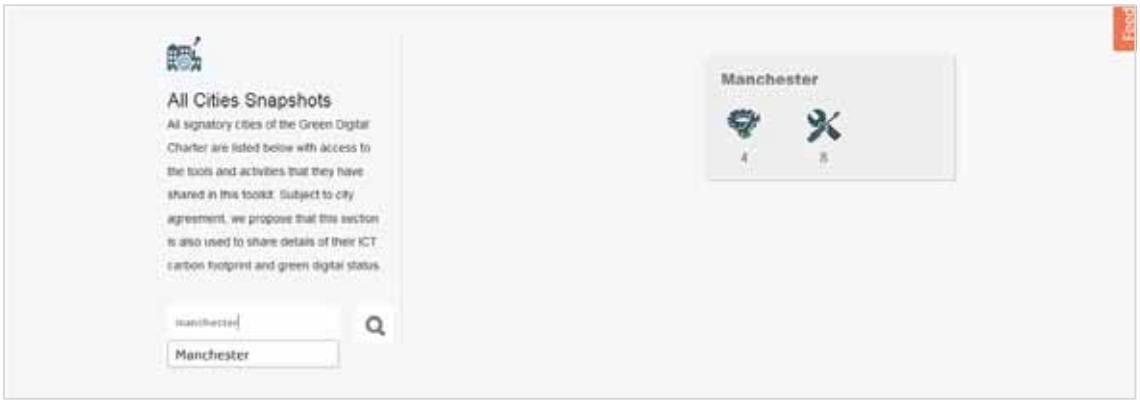
The All Cities Snapshot provides a summary view of the number of Activities and Tools contributed to the NiCE Toolkit by each GDC Signatory City.



All Cities Snapshot Page

The list of all cities can be quickly filtered by entering one or more characters in the Search Cities box on the left hand side of the list, under the introductory text.

As letters are entered, a list of Registered Cities that contain that character string is displayed in a list below the search entry box. Clicking on an entry in that list will cause it to populate the search entry box. Clicking on the "magnifying glass" icon or hitting return at that point will result in the entry for that city being displayed.



Searching the All Cities Snapshot Page

Clicking on the Activity icon for a City entry will take the user to the Activities page, filtered to show only the Activities for that city. If the Activities icon is clicked for a City that has yet to contribute an Activity (showing an Activity count of zero), the Activities page will be shown with an unfiltered list, of all Activities in the Toolkit.

Clicking on the Tool icon for a City entry will take the user to the Tools page, filtered to show only the Tools for that city. If the Tools icon is clicked for a City that has yet to contribute a Tool (showing a Tool count of zero), the Tools page will be shown with an unfiltered list, of all Tools in the Toolkit.

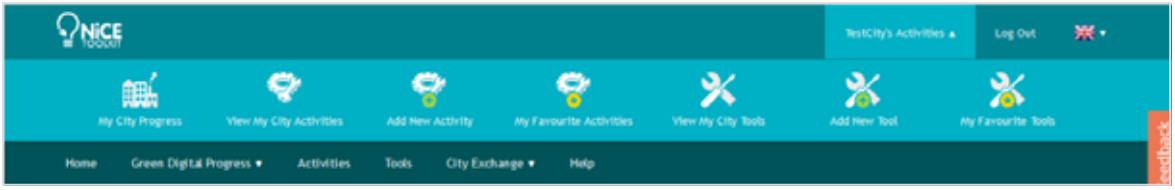
Early ambitions to also share summary details of Cities' progress, from the Green Digital SAQ and ICT Carbon Footprint tools, in the All Cities Snapshot have not been met as it is contrary to the principle, agreed with the Signatory Cities, of maintaining privacy on self-assessed performance results.

10 Registered User's Menu

A logged-in, authenticated, Registered User will see an additional link to the right hand side above the Main Menu bar, in the form of "*Cityname*'s Activities".

Clicking on this link opens an additional menu bar immediately above the Main Menu.

Each menu item may be selected by clicking on it.

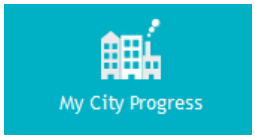


Registered User's Menu Expanded

10.1 Menu Items

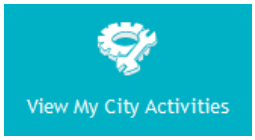
Many of these menu items are simple shortcuts to other parts of the site.

10.1.1 My City Progress



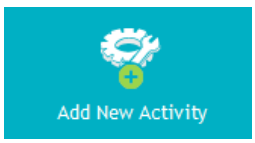
The user is taken to the Review my city's progress page in the chapter detailing Green Digital Progress.

10.1.2 View My City Activities



Displays the Activities page, filtered to only show the user's city's Activities.

10.1.3 Add New Activity

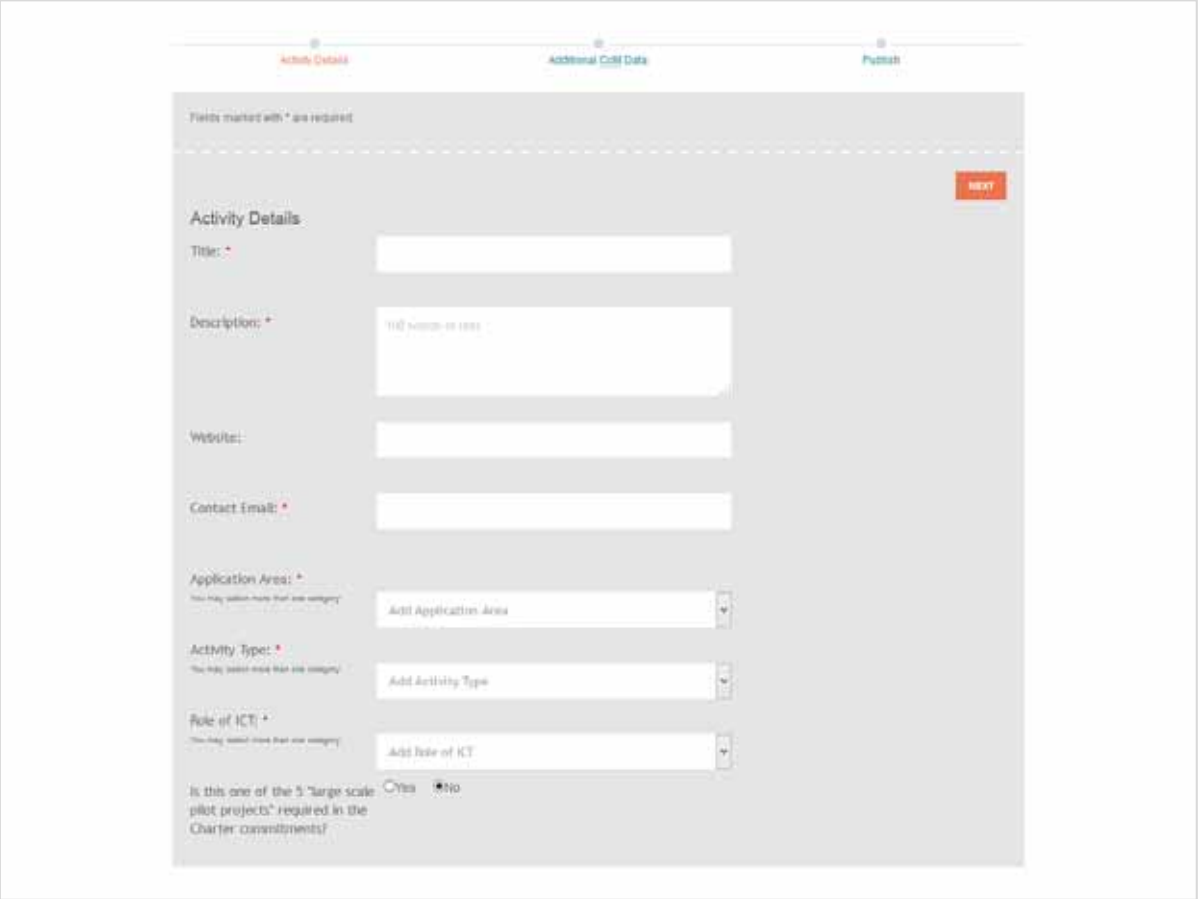


This is where a new Activity is added to a City's contribution portfolio.

Entry of a new Activity is via a three page form. Progress is indicated across the top of the form on any page.

Fields / boxes marked with a red '*' are required and must be completed in order to proceed.

10.1.3.1 Page 1 – Activity Details



Page 1 – Activity Details

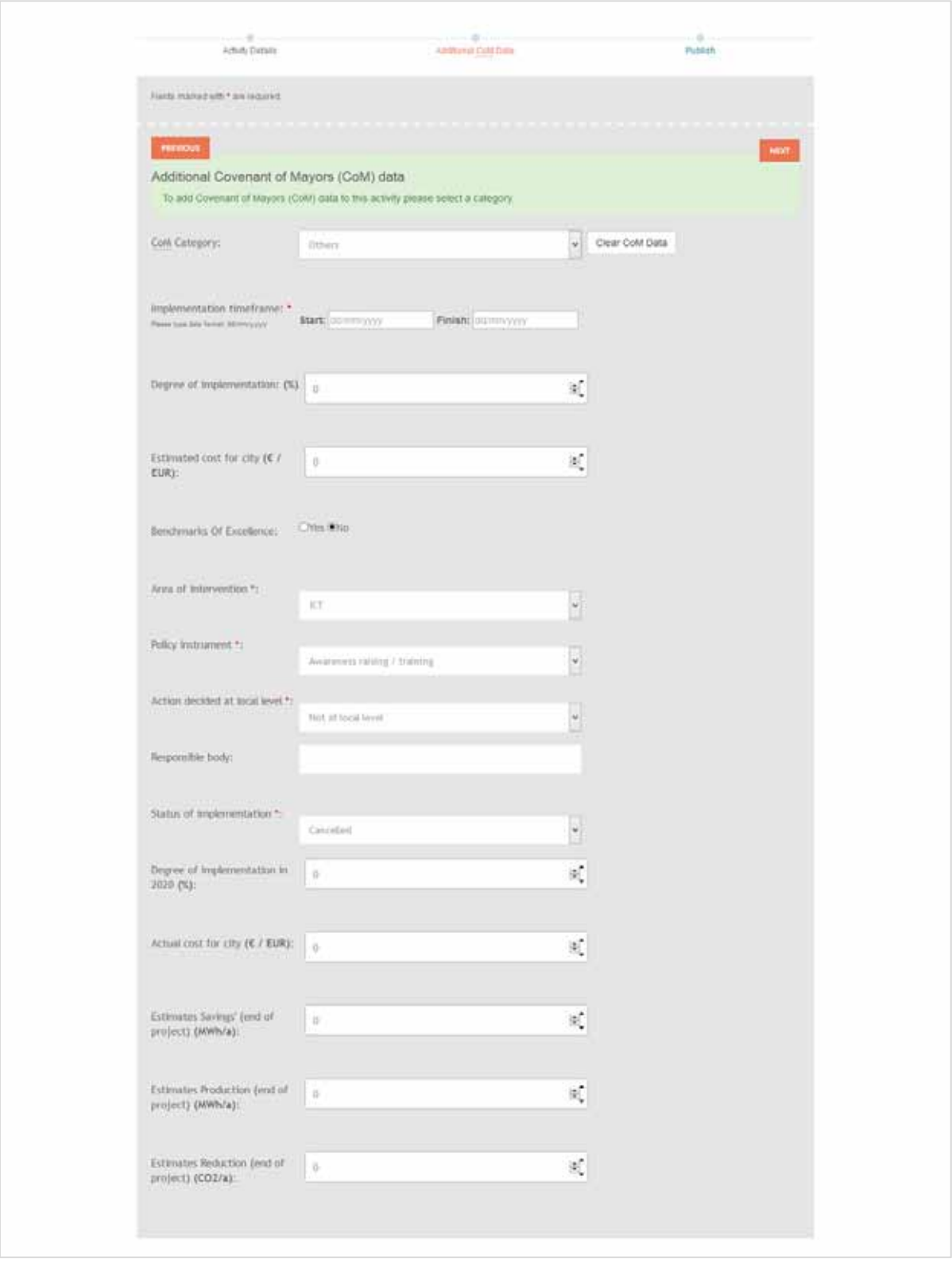
Field	Content	Comment
Title	Name of the Activity / project	Required. Needs to fit on one line
Description	Short description of the project incl. its key features / achievements	Required. Enter a maximum of 100 words
Website	Related external website URL for the project	Include http:// at the beginning of the URL
Contact Email	Address where someone with knowledge of the Activity may be reached by email	Required. Valid email address format

Application Area	Buildings Cross-domain Energy Green ICT Other domain Public lighting Transport	Required. GDC Framework. Multiple selections allowed.
Activity Type	Governance Policy Operational Exchange Monitoring	Required. GDC Framework. Multiple selections allowed.
Role of ICT	Efficiency Analysis / Decision making Perception / Behaviour Innovation / Substitution	Required. GDC Framework. Multiple selections allowed.
Is this one of the 5 "large scale pilot projects" required in the Charter commitments?	Yes / No	Enter Yes if this is one of the 5 major projects that a City commits to deliver under the GDC.

Click the Next button at the top right hand side of the page to move to Page 2.

10.1.3.2 Page 2 – Additional CoM Data

If the User's City is not a Covenant of Mayors (CoM) Signatory, then this page may be skipped.



Page 2 – Additional CoM Data

Selection of a CoM Category value opens up the remainder of the page.

Field	Content	Comment
CoM Category	Industry Local Electricity Production Local Heat / Cold Production Municipal Buildings, Equipment / Facilities Others Public Lighting Residential Buildings Tertiary Buildings, Equipment / Facilities Transport	
Implementation timeframe	Start Date and Finish Date	Required. Date format dd/mm/yyyy. Finish Date cannot be before Start Date.
Degree of implementation	Measure of how complete this Activity is at time of entry.	Integer in range 0-100
Estimated cost for city	Anticipate total cost on completion of the Activity in Euros.	Integer.
Benchmarks of Excellence	Yes / No	Select one of the proposed values - the one that best describes your project.
Area of intervention	Only selection is “ICT”	Required.
Policy instrument	Awareness raising / training Energy assessment and energy management Energy certification / labeling Energy suppliers obligations (eg white certificate) Financial mechanisms – Energy or carbon tax Financial mechanisms – Grants and subsidies (inc tax) Financial mechanisms – third part financing (inc ESCOs) Land use planning Minimum energy performance standards Mobility management No policy instrument Other Public procurement Regulation Standards for refurbishment and new development	Required. Select one of the proposed values - the one that best describes your project.

Action decided at local level	Not at local level Not possible to say Yes at local level	Required. Select one of the proposed values - the one that best describes your project.
Responsible body		Select one of the proposed values - the one that best describes your project.
Status of implementation	Cancelled Completed New Ongoing Pending	Required. Select one of the proposed values - the one that best describes your project.
Degree of implementation in 2020	Measure of how complete this Activity is anticipated as being by the end of 2020.	Integer in range 0-100
Actual cost for city	Actual total cost on completion of the Activity in Euros.	Integer. Select one of the proposed values - the one that best describes your project.
Estimates Savings (end of project)	Anticipated saving of energy by the end of the Activity	Integer. MWh per year
Estimates Production (end of project)	Anticipated additional production of energy by the end of the Activity	Integer. MWh per year
Estimates Reduction (end of project)	Anticipated reduction in production of CO2 by the end of the Activity	Integer. kgCO2e per year

Click the Next button at the top right hand side of the page to move to Page 3.

Click the Previous button at the top left hand side of the page to return to Page 1.

Click Clear CoM Data button to clear the Page 2 entries.

10.1.3.3 Page 3 - Publish

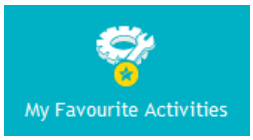
Click the Submit button to save the new Activity.

Click Previous button to return to Page 2.

Click Cancel to leave the form without saving the New Activity. (Displays an unfiltered Activities page).

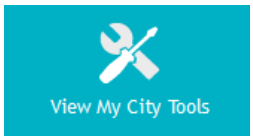
Page 3 - Publish

10.1.4 My Favourite Activities



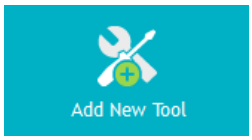
Displays the Activities page, filtered to only show Activities marked as Favourites.

10.1.5 View My City Tools



The user is taken to the Tools page, filtered to only show the user's city's Tools.

10.1.6 Add New Tool



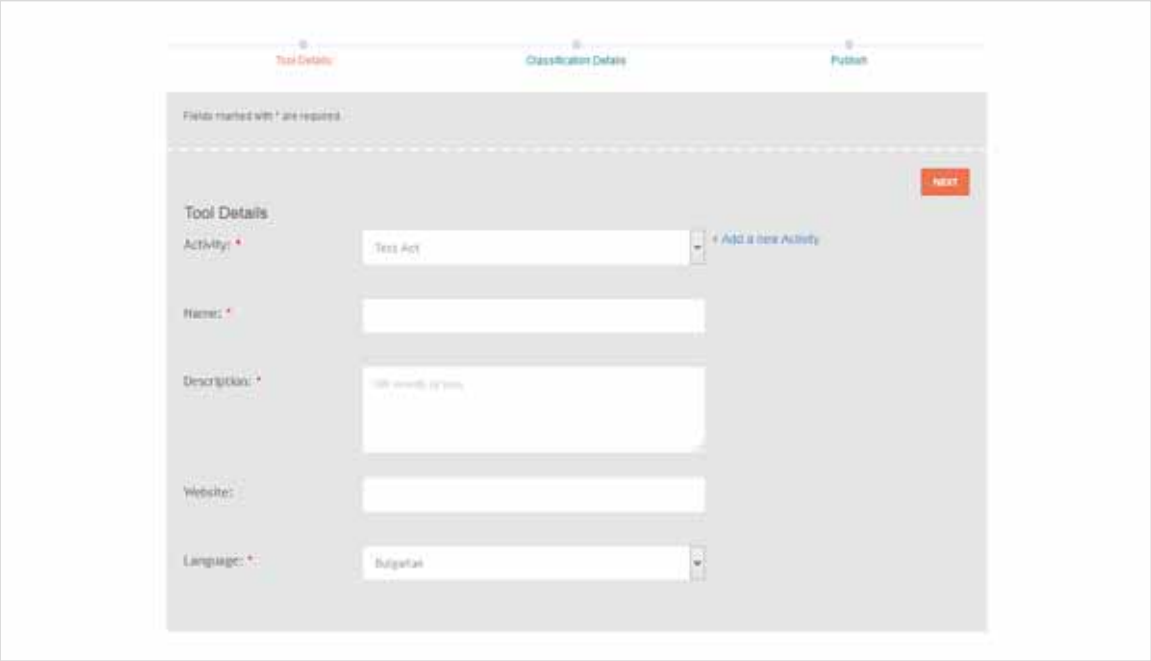
This is where a new Tool is added to a City's contribution portfolio.

Each Tool is associated with an Activity. A Tool cannot exist independently of an Activity.

Entry of a new Tool is via a three page form. Progress is indicated across the top of the form on any page.

Fields / boxes marked with a red '*' are required and must be completed in order to proceed.

10.1.6.1 Page 1 – Tool Details

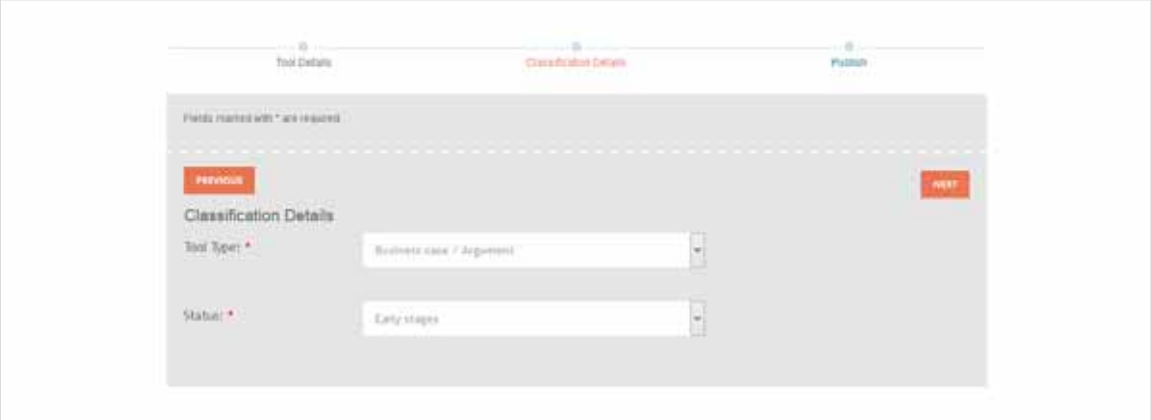


Page 1 – Tool Details

Field	Content	Comment
Activity	Name of the Activity / project with which this Tool is associated	Required. Select from a drop-down list of Activities already entered for this User's City. A link to set up a New Activity is given at the right hand side if needed.
Name	Name of the Tool	Required. Needs to fit on one line.
Description	Short description of the project incl. its key features / achievements	Required. Enter a maximum of 100 words
Website	Related external website URL for the project	Include http:// at the beginning of the URL
Language	Select from list of recognised languages	Required.

Click the Next button at the top right hand side of the page to move to Page 2.

10.1.6.2 Page 2 – Classification Details



Page 2 – Classification Details

Tool Type	Business case / Argument Project delivery Planning methodology Software	Required. Select one.
Status	Early stages Implemented Work-in-progress	Required. Select one.

Click the Next button at the top right hand side of the page to move to Page 3.

Click the Previous button at the top left hand side of the page to return to Page 1.

10.1.6.3 Page 3 – Publish

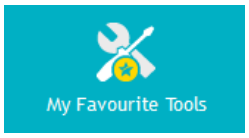
Page 3 - Publish

Tool Status	Publish / Keep private	Select one.

Click the Submit button to save the new Tool. Only Tools with a Status of Publish will be visible to users not from this user's City.

Click Previous button to return to Page 2.

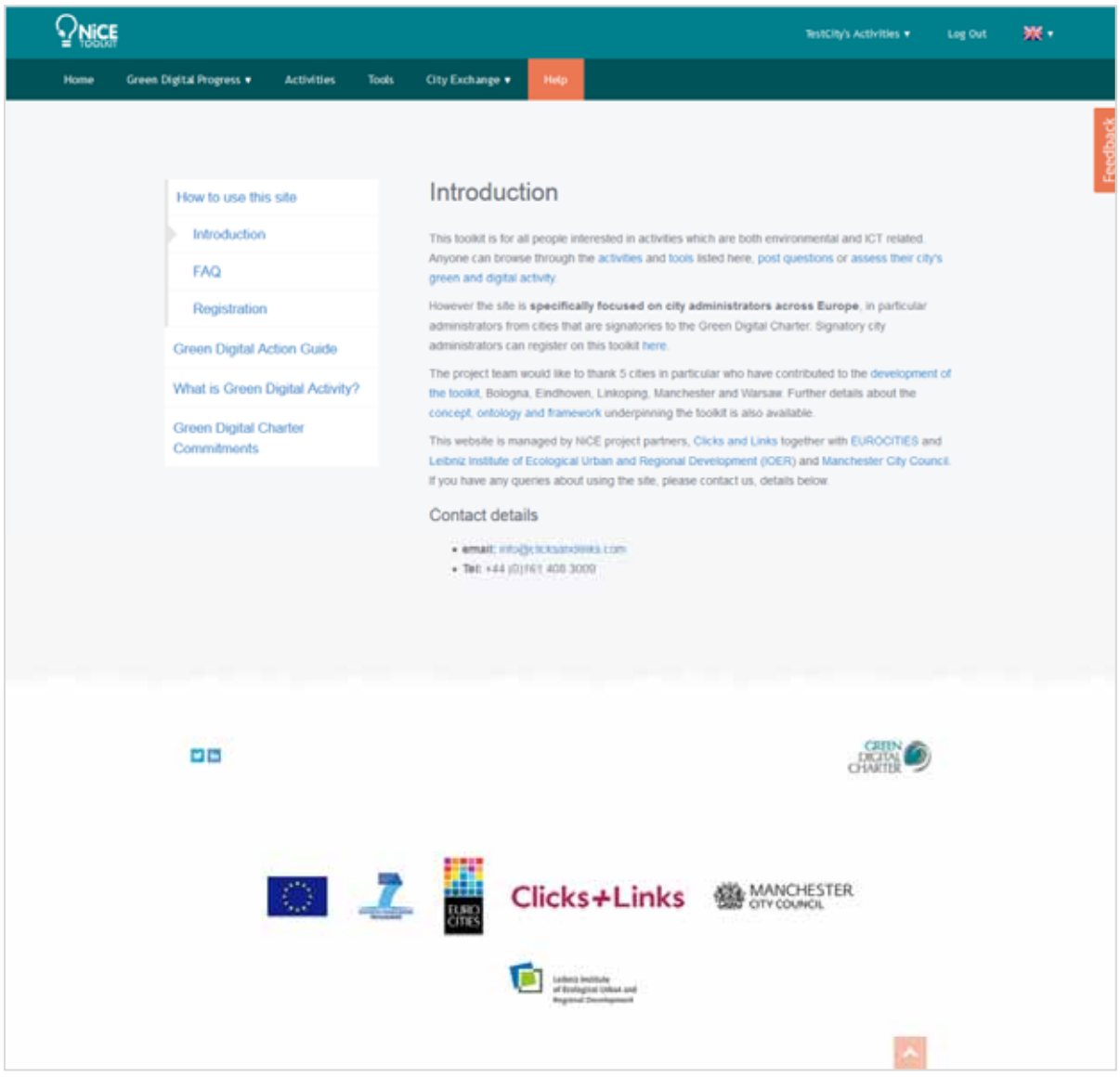
10.1.7 My Favourite Tools



Displays the Tools page, filtered to only show Tools marked as Favourites.

11 Help

The Help section gives information on how to use the Toolkit and about the Green Digital Charter and the Framework in general.



The Help Section

Use the navigation on the left-hand side of the screen to browse the pages of the Help section. The current page is denoted by the grey chevron next to the title in the menu.

The Help Section is divided into the following chapters and pages:

Chapter Title	Pages within chapter
How to use this site	Introduction FAQ Registration
Green Digital Action Guide	Introduction At a glance Action Guide Rationale Action process Framing Green Digital Action The Green Digital Toolkit
What is Green Digital Activity?	What is Green Digital Activity?
Green Digital Charter Commitments	Green Digital Charter Commitments

12 Contact Information

12.1 Eurocities

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12.2 Clicks and Links

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12.3 IOER

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Fax + 49 (0)351 46 79 212

12.4 Manchester City

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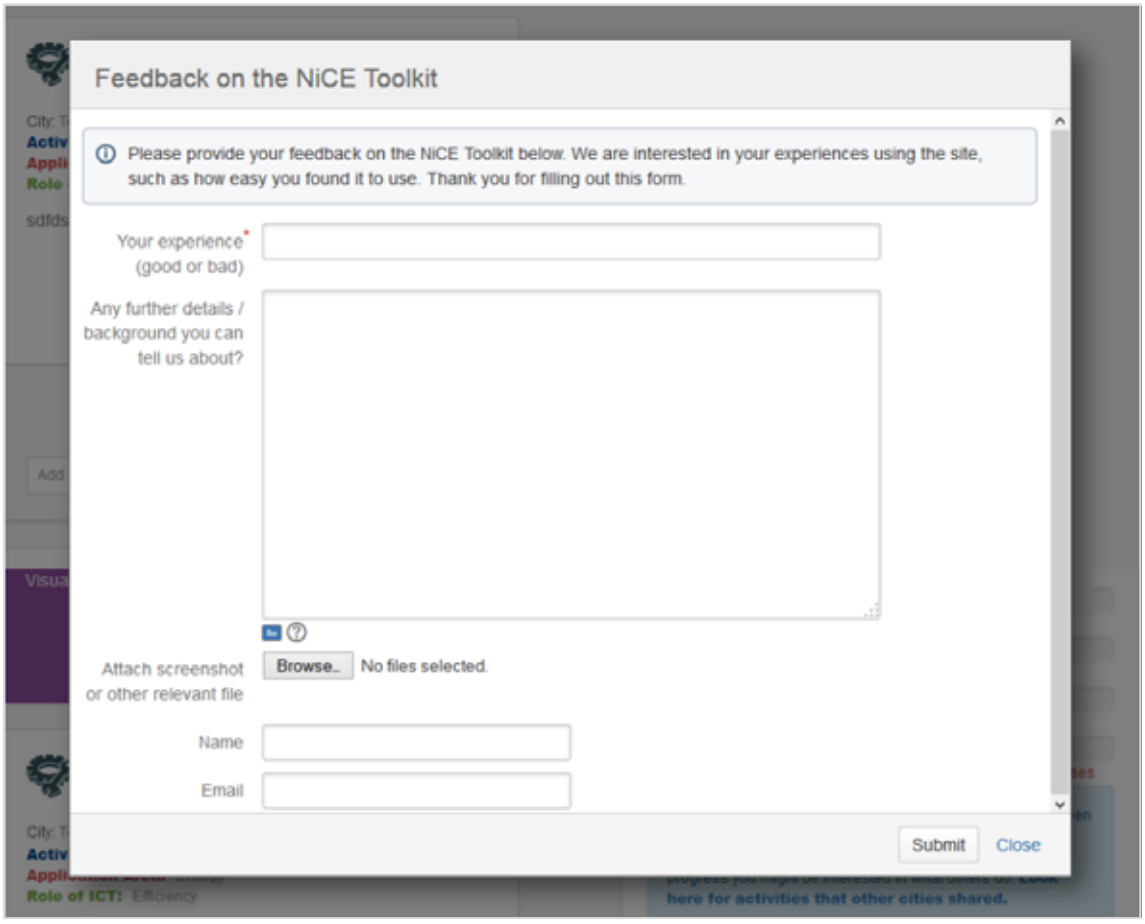
www.manchesterdda.com

13 Feedback tab

Users of the site can provide the Site Administrators with information about their experience of the website using the Feedback form. The form is activated by clicking the “Feedback” tab which features on every page on the right hand side of the page.

Be aware that to complete the form, you must scroll down the window to reveal all the form fields.



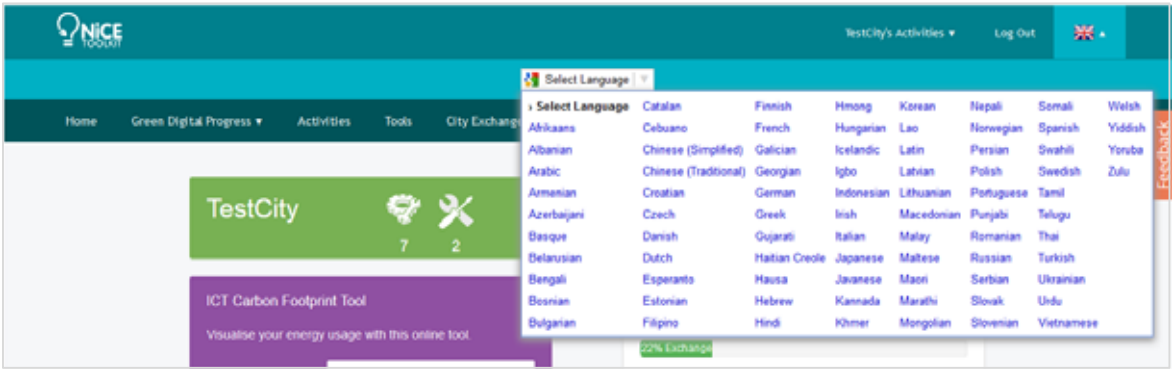
Feedback Window

Due to the sizing of the pop-up window being too large to be displayed correctly on mobile device screens, the Feedback Form button has been disabled and hidden from mobile device browsers.

14 Google Translation

The Google Translation function allows users to see the Toolkit website translated into their language. The function uses the Google Website Translator and further information can be found at the following URL: https://support.google.com/translate/ (Google account needed to login to view).

To use, click on the flag icon and expand the menu. Use the dropdown menu to select the language required. The text will change to the language selected and the dropdown menu will display the name of the current translation.



The Google Translate interface

15 Appendix A – Green Digital Charter Commitments

The Green Digital Charter commitments are drawn from the Charter document signed by the cities.

Acknowledge

I.D.	Commitment
A1.1	ICTs are critical enablers for sustainable growth
A1.2	ICTs must be integrated into the work of European cities to mitigate climate change
A2.1	European good practices for low-emissions ICT must be ... based on the practical experience of public authorities.
A2.2	Public authorities can set an example for others.
A3.1	Cities can lead Europe in maximising the potential for ICT to reduce emissions by ... delivering innovative technical solutions
A3.2	Cities can lead Europe in maximising the potential for ICT to reduce emissions by ... encouraging behavioural change

Commit

I.D.	Commitment
B1.1	Develop cities as platforms for innovation through ... digital planning to enable low carbon activities and achieve systemic carbon efficiencies
B1.2	Develop cities as platforms for innovation through ... new digital infrastructures to enable low carbon activities and achieve systemic carbon efficiencies
B1.3	Develop cities as platforms for innovation through ... services to enable low carbon activities and achieve systemic carbon efficiencies

B2.1 Demonstrate that cities can lead by practical example by ensuring that ... the city's own ICT infrastructure has the smallest possible carbon footprint

B2.2 Demonstrate that cities can lead by practical example by ensuring that ... the city's own digital services have the smallest possible carbon footprint

B3.1 Promote city's practices of leading by practical example to ensure that the city's own ICT infrastructure and digital services have the smallest possible carbon footprint towards the private sector

B3.2 Promote city's practices of leading by practical example to ensure that the city's own ICT infrastructure and digital services have the smallest possible carbon footprint towards the wider community

B4.1 Create new partnerships by connecting leaders and stakeholders together in each city

B4.2 Secure practical commitments for implementing a new green digital agenda

B5.1 Promote integrated approaches

B5.2 Promote large-scale solutions

B5.3.1 Promote through the implementation of a series of digital applications for improving measurement of energy use

B5.3.2 Promote through the implementation of a series of digital applications for improving transparency and visibility of energy use

B6.1 Realise test-bed implementation projects

B6.2 Involve citizens, service providers, businesses and public sector organisations in test-bed implementation projects

B7.1 Support open innovation by encouraging low carbon activities in all sectors

B7.2 Support open innovation by promoting low carbon activities in all sectors

B7.3 Support open innovation by encouraging and promoting low carbon activities in all sectors through R&D activities in user-driven, open innovation environments

B7.4 Support open innovation by encouraging and promoting low carbon activities in all sectors through deployment projects in user-driven, open innovation environments

Agree

I.D.	Commitment
C1	Implement a strategy to promote green connected cities
C1.1	Make the most effective use of ICT as a platform for the economic wellbeing of all citizens
C1.2	Make the most effective use of ICT as a platform for the social wellbeing of all citizens
C1.3	Make the most effective use of ICT as a platform for the environmental wellbeing of all citizens
C2.1	Deploy ICT to change the way our communities link to each other
C2.2	Deploy ICT to change the way our communities link to the environment
C3	Promote inclusive sustainability by recognising that action on climate change is required by all members of the community, including households and SMEs
C4	Ensure that ICT-enabled climate change initiatives will go hand in hand with work to promote social cohesion, given the large concentrations of socially excluded people in many cities
C5.1	Promote ICT innovation for climate change mitigation which maximises the benefits for local communities
C5.2	Promote ICT innovation for climate change mitigation which maximises the benefits for businesses

Ensure

I.D.	Commitment
D1.1	Ensure that ICTs are more energy efficient by ... encouraging the use of low emission ICT equipment, including intelligent "thin client" facilities
D1.2	Ensure that ICTs are more energy efficient by ... encouraging the use of low emission ICT equipment, including smarter uses of laptops

D1.3 Ensure that ICTs are more energy efficient by ... encouraging the use of low emission ICT equipment, including more energy efficient servers

D2.1 Use renewable energy sources to power ICT

D2.2 Utilise energy emissions from ICT to heat buildings for example

D3.1 Ensure that city use of hosting and data centres is as green as possible by ...maximising renewable energy use to control ICT emissions and encourage green ICT

D3.2 Ensure that city use of hosting and data centres is as green as possible by ... sharing services with other users to control ICT emissions and encourage green ICT

D3.3 Ensure that city use of hosting and data centres is as green as possible through ... planning rules to control ICT emissions and encourage green ICT

D3.4 Ensure that city use of hosting and data centres is as green as possible, through ... compliance arrangements to control ICT emissions and encourage green ICT

D3.5 Ensure that city use of hosting and data centres is as green as possible through ...service level agreements to control ICT emissions and encourage green ICT

D4 Implement a strategic commitment to improve the sustainability of the production, use and disposal of ICT equipment

D5.1 Ensure the measurability, transparency and visibility of emissions & energy data by developing common standards to collect, collate and analyse emission and energy data across the city administration

D5.2 Ensure the measurability, transparency and visibility of emissions & energy data by developing common standards to collect, collate and analyse emission and energy data across the city as a whole

D6 Ensure the compatibility of data on ICT impacts with the measurement of data on emissions, (including working in partnership with initiatives such as the Covenant of Mayors);

D7 Be innovative with the use of new tools to make data and their analysis as transparent and visible as possible, for example through "ecomaps", the use of Geographical Info Systems (GIS) and the Urban Atlas initiative

D8.1 Ensure that ICT solutions facilitate energy-efficient, "smart" processes by improving the energy efficiency of buildings by applying common standards for new buildings

D8.2 Ensure that ICT solutions facilitate energy-efficient, "smart" processes by improving the energy efficiency of buildings by applying common standards for retro-fitting existing buildings

D9.1 Apply innovation in ICT systems and services for transport and urban mobility ... including smart public transport networks

D9.2 Apply innovation in ICT systems and services for transport and urban mobility ...including greater use of tele-conferencing

D9.3 Apply innovation in ICT systems and services for transport and urban mobility ... including more sustainable ways of working

D10.1 Develop "smart" energy grids to support greater use of renewable energy

D10.2 Develop "smart" energy grids to support greater use of micro-generation

D10.3 Develop "smart" energy grids to support greater use of more energy efficient lighting systems

D11.1 Collaborate with industry to support greener production

D11.2 Collaborate with industry to support greener logistics

D11.3 Collaborate with industry to support using green procurement

D12 Enable transformational approaches to ICT, which drive new values and behaviours

D12.1 Enable transformational approaches to ICT, which drive new values and behaviours ... by supporting the creation of broadband networks based on high-capacity optical fibre and advanced wireless and mobile solutions

D12.2 Enable transformational approaches to ICT, which drive new values and behaviours by supporting ... the creation of advanced wireless and mobile applications

D13 Develop or support innovative new services based on the highest speeds and capacities of these networks to transform the way that we run our cities

D13.1 Develop or support innovative new services based on the highest speeds and capacities of these networks to transform the way that we run our cities

D13.2 Develop or support innovative new services based on the highest speeds and capacities of these networks to transform the way that we work

D13.3 Develop or support innovative new services based on the highest speeds and capacities of these networks to transform the way that we live

D13.4 Develop or support innovative new services based on the highest speeds and capacities of these networks to transform the way that we play

D14 Enable the "restructuring" of the way we organise economic processes so that the use of materials and energy can be reduced while enhancing the quality and quantity of jobs

D14.1 Enable the "restructuring" of the way we organise economic processes so that the use of materials and energy can be reduced while enhancing the quality of jobs

D14.2 Enable the "restructuring" of the way we organise economic processes so that the use of materials and energy can be reduced while enhancing the quantity of jobs

D15 Develop opportunities for innovation in eGovernment to transform public services, for example through mobile channels

D15.1 Develop opportunities for innovation in eGovernment to transform public services, for example through enhanced mobile channels

D15.2 Develop opportunities for innovation in eGovernment to transform public services, for example through enhanced strategic planning

D15.3 Develop opportunities for innovation in eGovernment to transform public services, for example through virtual policy modelling

D15.4 Develop opportunities for innovation in eGovernment to transform public services, for example through enhanced scenario planning

D15.5 Develop opportunities for innovation in eGovernment to transform public services, for example through enhanced simulations

D15.6 Develop opportunities for innovation in eGovernment to transform public services, for example through enhanced visualisations

D16 Transform citizen engagement through eParticipation, greater co-production by citizens of content and services, consequently better opportunities for improved skills, employment, inclusion, well-being and quality of life.

D16.2 Transform citizen engagement .. through eParticipation

D16.3 Transform citizen engagement ... through greater co-production by citizens of content and services

D16.4 Transform citizen engagement ... through consequently better opportunities for improved skills, employment, inclusion, well-being and quality of life.

D17 Provide a commitment to open innovation platforms and methodologies through the further development of the Living Labs network across Europe, including creating new city-based Living Labs and developing new open innovation initiatives for low carbon solutions.

D17.1 Provide a commitment to open innovation platforms and methodologies through the further development of the Living Labs network across Europe

D17.2 Provide a commitment to open innovation platforms and methodologies through the further development of the Living Labs network across Europe, including new city-based Living Labs

D17.3 Provide a commitment to open innovation platforms and methodologies through the further development of the Living Labs network across Europe, including new open innovation initiatives of low carbon solutions

Aim

I.D. Commitment

E1 Work with Green Digital Charter signatories on ICT & Energy Efficiency

E2 Deploy five large-scale ICT pilots per city addressing the above areas within 5 years

E3 Decrease ICT direct carbon footprint per city by 30% within 10 years

Enable

I.D. Commitment

F1.1 Make use of the vast expertise within the EUROCITIES network

F1.2 Make use of the EU funded project NiCE (Networking intelligent Cities for Energy Efficiency) to coordinate efforts

F2 Develop an implementation roadmap on Green Digital Charter commitments

F3 Build benchmarks of good practice

F4 Seek external sources of funding to support ambitions

16 Appendix B - The Green Digital Charter Framework

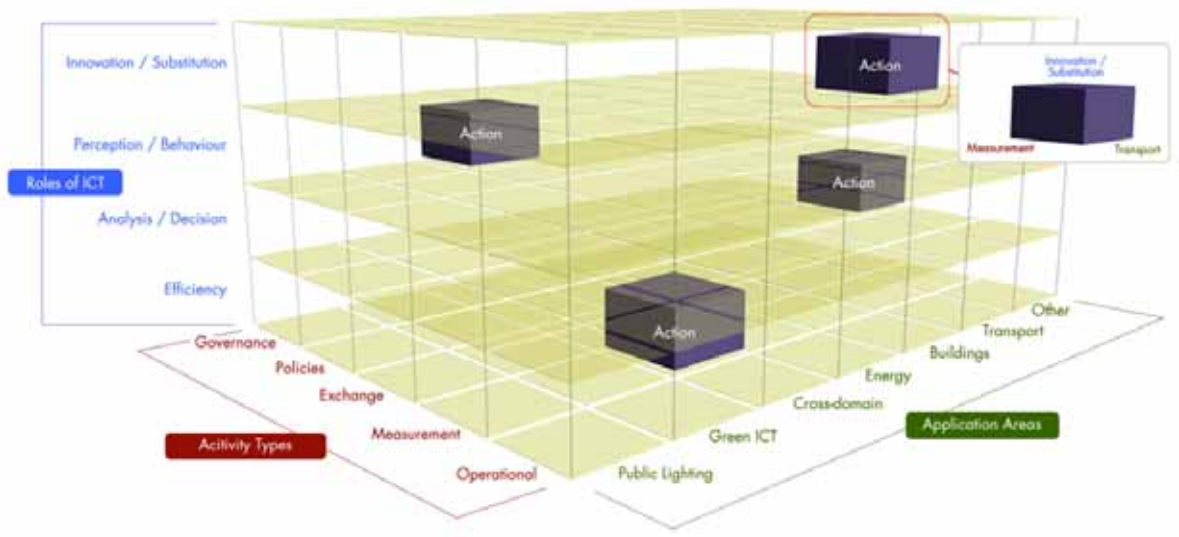
The GDC Toolkit is underpinned by a conceptual framework and ontology.

This 'Action Framework' is derived from the commitments in the Green Digital Charter, European policies, city initiatives and activities, plus direct feedback from cities.

It comprises three dimensions:

- Application Areas
- Activity Types
- Role of ICT.

Any intersect of the dimensions may be considered a 'space for action', whilst the matrix as a whole defines a scope for green digital action.



The ontology formed by the framework provides a common, unambiguous reference for cities to exchange information and experiences, identify gaps and undertake activity. It may be used to support and reference wider city activity related to carbon reduction.

Dimension 1: Application Areas

The Application Areas are based around the five key EC policy areas of energy, building, transport, public lighting and green ICT. A cross-domain and 'other' area have been added for completeness.

Subdomains are associated with each Application Area for more granular categorization and analysis, with each subdomain specifically mapped onto Covenant of Mayors (CoM) categories to ease reporting of green digital activities under CoM.

Application Area	Subdomains	Classification examples
Energy	Electricity production	Adoption of standards for collecting, comparing and analysing emission and energy data across the city administration; implementation of smart energy grids; advanced planning tools to support greater use of renewable energy sources and micro generation
	Electricity distribution	Territorial cooperation for the extension of electricity infrastructures, implementation of smart energy grids to support the integration of renewable energy sources and micro generation into electricity grids.
Building	Municipal buildings, facilities	Application of common standards for new buildings and retro-fitting existing buildings; implementation of smart meters in city administration buildings, schools and, libraries
	Tertiary (non-municipal) buildings, facilities	Creation of open innovation platforms for integrating renewable energy sources into building structures; implementation of advanced energy management systems in offices or museums
	Residential buildings	Citizen involvement or test-bed projects for smart homes; implementation of demand side management systems in residential buildings
	Industries (excluding industries involved in Emissions Trading Scheme)	Strategic concept for improving the energy efficiency of lighting systems; implementation of intelligent lighting systems in production and storage buildings
Transport	Soft modes	Trip planners or on-trip services for cycling or walking (non-motorised transport); public bicycle rental systems
	Public transport	Real-time passenger information services; smart card systems for ticketing and services; bus priority schemes
	Motorised private	Parking management systems; car sharing schemes; usage-based road pricing
	Demand management	Mixed-land-use and urban design simulations; car-pooling and lift sharing schemes; teleworking and teleconferencing
	Logistics / freight	Freight transport guidance systems; green logistics and hubs
Public lighting	-	Territorial cooperation for smart lighting systems; implementation of sensor-based lighting systems
Green ICT	-	Procurement rules or service level agreements to minimise the carbon footprint of ICT infrastructures

Application Area	Subdomains	Classification examples
		digital services; use of renewable energy sources to power ICT
Cross-domain	-	A city strategy that states green digital development as a main priority; extensions of digital infrastructures and services to enable low carbon activities such as decision support tools for household or enterprise location.
Other domains	Industrial processes	Collaboration with industry to support green digital processes; implementation of smart manufacturing systems
	Waste	Service level agreements for sharing information electronically to avoid using paper resources; implementation of intelligent recycling systems
	Land use	**Advanced planning and policy simulation software; use of Geographical Information Systems (GIS) or the Urban Atlas initiative to provide ecomaps**

Dimension 2: Activity Types

Under the Framework, activity around green digital action is categorized into five main Activity Types; governance, policy, exchange, monitoring and operational. Each of these has associated subdomains, for more granular classification and analysis.

Activity Type	Subdomains	Classification examples
Governance	Stakeholder involvement	Activities that enable the partnership, stakeholder structures and work methods that facilitate green digital activity.
	Territorial cooperation	
	Partnerships	
	Commitments	

Activity Type	Subdomains	Classification examples
Policy	Strategy	Activities that provide guidance and orientation, set a framework for action and drive innovation for green digital development
	Roadmap	
	Rules/regulation	
	Procurement of goods and services	
	Open innovation	
	Broadband	
Exchange	Study Tours	Activities that support city-to-city learning and knowledge transfer
	City Networks	
	Peer to Peer Learning	
Monitoring	Good practice benchmarks	Activities that enable measurement, assessment and comparison of green digital developments
	Measurement standards	
	Data collection & analysis	
Operational	Test-bed projects	Activities that implement green digital technologies and practices on the ground
	Living labs	
	Large-scale pilots	
	Other implemented solutions	
	Planning and management	
	Services and engagement	

Dimension 3: Roles of ICT

The Framework classifies ICT contribution by four roles; efficiency, analysis/decision making, perception/behaviour and innovation/substitution.

Role of ICT	Description
Efficiency	Use of ICT for improvements of conventional systems, processes, operations, etc. for energy efficiency and carbon emission reduction
Analysis / decision making	Use of ICT for data collection, analysis and interpretation for decision support within/across organisations for energy efficiency and carbon emission reduction
Perception / behaviour	Use of ICT for data visualisation and interpretation addressing individuals and households for energy efficiency and carbon emission reduction
Innovation / substitution	Use of ICT for design and/or support of new systems and processes or replacement of conventional ones for energy efficiency and carbon emission reduction

17 Appendix C - Guide to ICT Carbon Footprint measurement tool

The aim of this ICT Footprint measurement tool is to develop a method and technique which is flexible and complementary to existing methods that cities already use. It draws on existing international standards and methodologies (such as the ITU's L.1400 recommendations[6], GHG protocol, the Carbon Disclosure Project, as well as standards from International Bodies such as ISO14064) to enable cities to measure, compare and report on ICT's direct carbon footprint at a city level.

This tool is complimented by an online visualization tool to allow comparison of metrics across a specified time period, thereby supporting cities to evaluate their status in meeting the Green Digital Charter target of 30% reduction of CO2 emissions on ICT equipment over 10 years.

This ICT carbon measurement process provided in this document can be used by anyone. The visualization tool described can only be used by signatories of the Green Digital Charter (www.greendigitalcharter.eu) who have login access to the Green Digital Toolkit.

17.1 Approach

By following the 7-steps guide below, a City / Municipality can measure aspects of their ICT Footprint and analyse the results. The ICT Carbon Footprint measurement tool should be viewed as an iterative process, added to, or refined as local ICT records, relating to both equipment owned, or used (eg. outsourced services; 3rd parties who may attach their own ICT devices) by a City are identified, and/or authoritative data on energy usage for all ICT devices are published.

It is therefore recommended that a City's first attempt at measuring their ICT Footprint should be based on a self-contained Department which has a good record of their ICT assets. Once they have an ICT Footprint 'score', this should also identify where there are gaps and how they might refine the process. Especially in relation to equipment where there is no published energy rating, or possibly where on the first pass an estimated

[6] The L.1400 series of recommendations published by the International Telecommunications Union (ITU) presents general principles on assessing the environmental impact of information and communication technologies (ICT) and outlines the different methodologies that are being developed, namely:

L.1410 Environmental impact of ICT goods, networks and services

L.1420 Environmental impact of ICT in organisations

L.1440 Environmental impact of ICT in cities (expected in 2012-2013)

figure was used and subsequently an Agency (such as the ITU or Energy Star) has updated/expanded their energy / CO^2 database for ICT equipment.

17.2 In Summary

17.2.1 7-step guide to measuring carbon footprint of ICT

This guide describes a process for cities to capture their energy data. This data can be collected in table format for city analysis. An example table is provided below.

ICT Carbon Footprint measurement tool v.1

Organisational Scope	Operational Scope	Time in Use	Time on Standby	Switched off	Power usage (watts)			Annual unit consumption	Number of units	Total power consumption pa.	Total Cost	CO_2 emissions (%)
Detail City Depts.	Categories ICT Assets	(hours per year)	(hours per year)	(hours per year)	in-use	standby	switched off	(kWh)		(kWh)	Pence per kWh	(kgCO2e)
	Device Type										12.5	0.5246
Example - Finance	HP LaserJet printer	250	8410	0	550	7	0.4	251.37	6	1508.22	£ 188.53	131.87
Example - Finance	Laptop - type 1	1840	460	6460	65	19	0	127.88	24	3069.12	£ 383.64	67.09
Example - Finance	Desktop - type a	1840	1380	5540	80	5	0.5	120.07	10	1200.70	£ 150.09	62.99
Example - HR	HP LaserJet printer	320	160	8280	550	7	0.4	180.43	3	541.30	£ 67.66	94.83
Your city details here											£ -	-
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										Totals	£ -	-

Figure 1: An example table for gathering ICT carbon footprint data

Key outputs from this data can be uploaded into a visualization tool on the Green Digital Toolkit using the spreadsheet provided:
http://www.greendigitalcharter.eu/nice_toolkit/documents/Template.csv

This spreadsheet captures the essential data for tracking the ICT carbon usage over time namely:

- Asset
- Number of unit
- Uptime (hours)
- Standby (hours)
- Downtime (hours)
- Consumption (kWh)
- CO2 emissions (kgCO2e)
- Total Cost (your preferred currency or Euros)

The data is plotted into a graph and provided in summary as a snapshot for analysis.

Figure 2: App for Visualizing ICT carbon footprint data over time

17.2.2 Gathering the ICT carbon footprint data

Step 1 – Organisational Scope – as stated in Recommendation ITU-T L.1420, "the organizational boundaries define which parts of the organisation to include in the energy consumption or emissions assessment (eg. main units, subsidiaries, joint ventures etc)", adding that irrespective of the approach chosen, ICT organisations should take into account all facilities used for the operation of the organisation, whether owned or rented.

Therefore at the outset of any ICT Footprint Reporting task, a City must firstly define / agree the boundaries of the departments[7] that are to be included (and excluded) from the City/Municipality's ICT Footprint.

Note: the data is best captured at a departmental level; thereby encouraging greater accountability for departmental footprints as well as ownership and accountability for a reduction plan manageable within a defined area of responsibility.

[7] In the context of ICT Footprint Reporting, a "department" can be any function from a unit within the City council, to a mainstream function, such as education (eg. schools) or health (eg. hospitals).

Step 2 – Define the Assets - gather data on the type[8] and number[9] of ICT devices to be included (NB. initial estimates can be refined with further ICT devices, improved analysis of device types, or other factors such as a cooling for high end devices).

Step 3 – Estimate – how much time in hours, on average, an asset is in use and is on standby, on an annual basis.

Step 4 – Count / Calculate – how much energy, in terms of kilowatt hours (kWh) each asset type uses, both when in use and on standby.

Energy use as duration

Calculating energy usage of ICT equipment can be either estimated as a rough guess or carefully measured based on the resources available to the city. At the very least, a city can use its energy bills and an estimation of working hours to calculate the period of time used by ICT equipment, categorized by when in use, on standby and off. Tools are also available to monitor equipment on an IP network to establish their on/off/standby status. One such tool (EasyArp) has been developed for the Green Digital Charter and is available from the Linkoping administration in Sweden in the Green Digital Toolkit.

Energy use by asset type

Currently there is no single source of trusted data on actual usage of energy by the wide range of ICT equipment used in cities. Cities are therefore developing their own methods for calculating energy usage (see Linkoping case study in this document). Products are available which will calculate the energy of equipment using 'plug in' monitors. Cities are encouraged to share the data they are capturing on energy use of ICT equipment with each other.

There is a European version of the Energy Star database (www.eu-energystar.org/en/database.shtml) where energy consumption data for office and related ICT equipment can be used. This is mainly restricted to office ICT equipment e.g. desktop and notebook computers; workstations; small-scale servers; monitors and imaging equipment. There are two ways in which the Energy Star database can be deployed. The more time consuming, but accurate way is to extract the number of devices of a specific make, type and configuration (eg. Compaq laptop with Windows 7), and 'Search Database' – see examples in Figures 3 and 4, below:

[8] A list of equipment categories together with their energy use, energy cost and CO_2 Emissions complement the list contained in the Annex of L.1420, and are reproduced in this document as Annex A.

[9] The number of each type of device can be derived from an inventory list / asset register or an equipment audit provided by a City / Department.

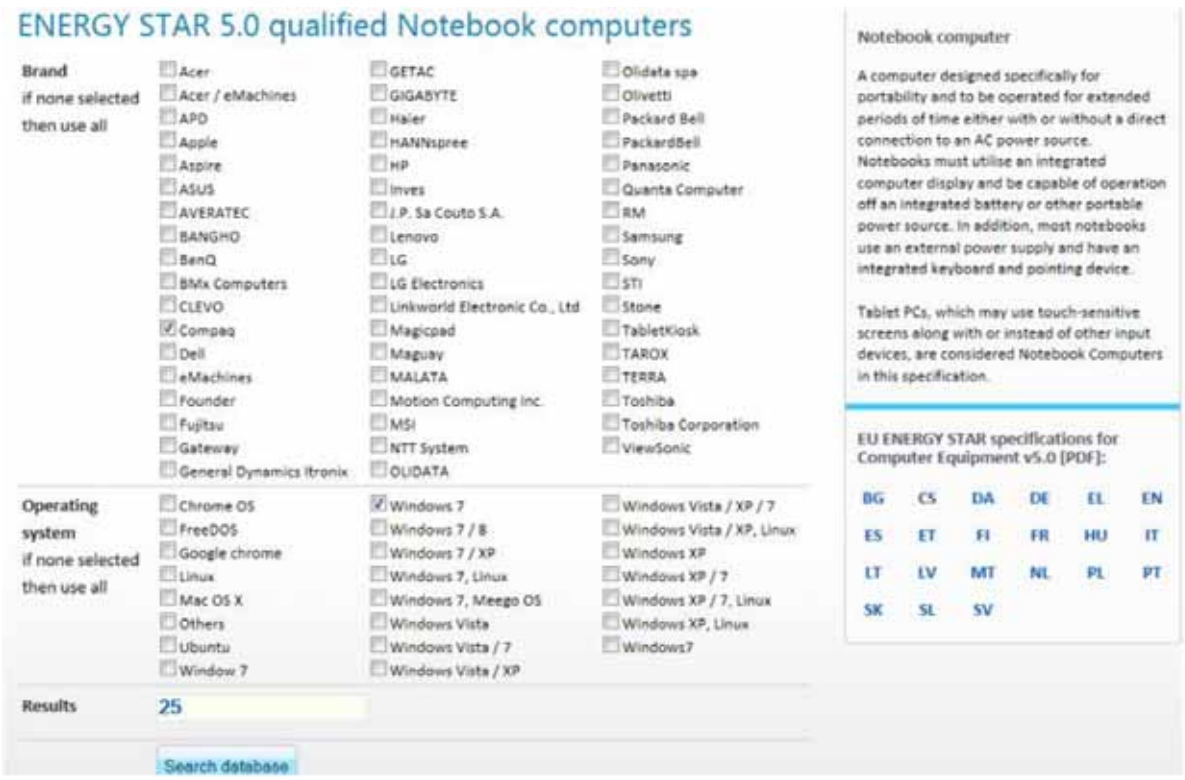
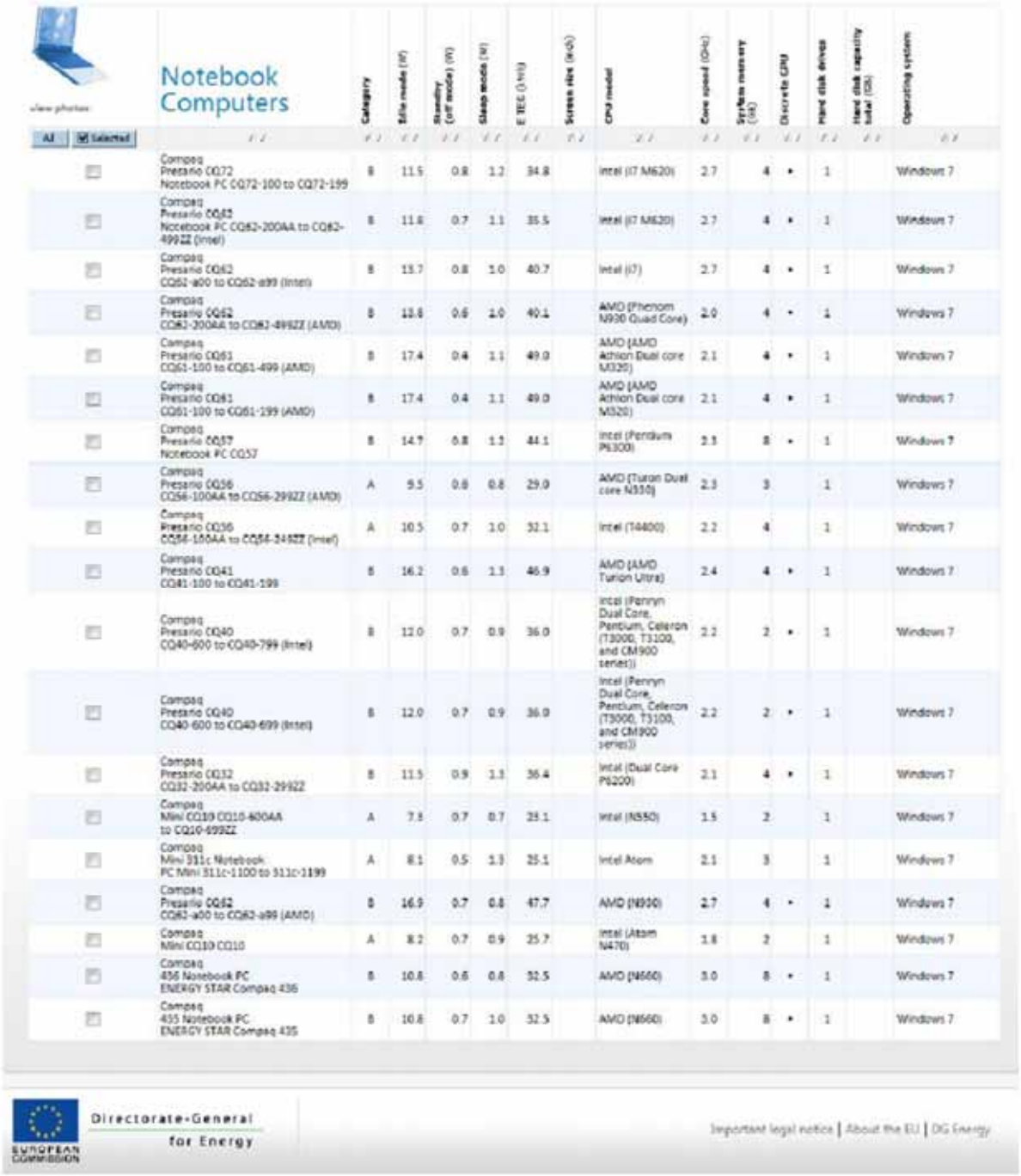


Figure 3: Energy Star database – Refine search



Notebook Computers

Category	Idle mode (W)	Standby (off mode) (W)	Sleep mode (W)	E TEC (kWh)	Screen size (inch)	CPU model	Core speed (GHz)	System memory (GB)	Discrete GPU	Hard disk drives	Hard disk capacity total (GB)	Operating system
Compaq Presario CQ72 Notebook PC CQ72-100 to CQ72-199	B	11.5	0.8	1.2	34.8	Intel (i7 M620)	2.7	4	•	1		Windows 7
Compaq Presario CQ62 Notebook PC CQ62-200AA to CQ62-499ZZ (Intel)	B	11.6	0.7	1.1	35.5	Intel (i7 M620)	2.7	4	•	1		Windows 7
Compaq Presario CQ62 CQ62-a00 to CQ62-a99 (Intel)	B	13.7	0.8	1.0	40.7	Intel (i7)	2.7	4	•	1		Windows 7
Compaq Presario CQ62 CQ62-200AA to CQ62-499ZZ (AMD)	B	13.8	0.6	1.0	40.1	AMD (Phenom N930 Quad Core)	2.0	4	•	1		Windows 7
Compaq Presario CQ61 CQ61-100 to CQ61-499 (AMD)	B	17.4	0.4	1.1	49.9	AMD (AMD Athlon Dual core M320)	2.1	4	•	1		Windows 7
Compaq Presario CQ61 CQ61-100 to CQ61-199 (AMD)	B	17.4	0.4	1.1	49.9	AMD (AMD Athlon Dual core M320)	2.1	4	•	1		Windows 7
Compaq Presario CQ57 Notebook PC CQ57	B	14.7	0.8	1.3	44.1	Intel (Pentium P6300)	2.3	8	•	1		Windows 7
Compaq Presario CQ56 CQ56-100AA to CQ56-299ZZ (AMD)	A	9.5	0.8	0.8	29.0	AMD (Turon Dual core N530)	2.3	3		1		Windows 7
Compaq Presario CQ56 CQ56-100AA to CQ56-549ZZ (Intel)	A	10.5	0.7	1.0	32.1	Intel (T4400)	2.2	4		1		Windows 7
Compaq Presario CQ41 CQ41-100 to CQ41-199	B	16.2	0.6	1.3	46.9	AMD (AMD Turion Ultra)	2.4	4	•	1		Windows 7
Compaq Presario CQ40 CQ40-600 to CQ40-799 (Intel)	B	12.0	0.7	0.9	36.0	Intel (Penryn Dual Core, Pentium, Celeron (T3000, T3100, and CM900 series))	2.2	2	•	1		Windows 7
Compaq Presario CQ40 CQ40-600 to CQ40-699 (Intel)	B	12.0	0.7	0.9	36.0	Intel (Penryn Dual Core, Pentium, Celeron (T3000, T3100, and CM900 series))	2.2	2	•	1		Windows 7
Compaq Presario CQ32 CQ32-200AA to CQ32-299ZZ	B	11.5	0.9	1.3	36.4	Intel (Dual Core P6200)	2.1	4	•	1		Windows 7
Compaq Mini CQ10 CQ10-600AA to CQ10-699ZZ	A	7.5	0.7	0.7	25.1	Intel (N550)	1.5	2		1		Windows 7
Compaq Mini 311c Notebook PC Mini 311c-1100 to 311c-1199	A	8.1	0.5	1.3	25.1	Intel Atom	2.1	3		1		Windows 7
Compaq Presario CQ62 CQ62-a00 to CQ62-a99 (AMD)	B	16.9	0.7	0.8	47.7	AMD (N930)	2.7	4	•	1		Windows 7
Compaq Mini CQ10 CQ10	A	8.2	0.7	0.9	25.7	Intel (Atom N470)	1.8	2		1		Windows 7
Compaq 436 Notebook PC ENERGY STAR Compaq 436	B	10.8	0.6	0.8	32.5	AMD (N660)	3.0	8	•	1		Windows 7
Compaq 435 Notebook PC ENERGY STAR Compaq 435	B	10.8	0.7	1.0	32.5	AMD (N660)	3.0	8	•	1		Windows 7

Directorate-General for Energy

Figure 4: Energy Star database – Search results

Alternatively an approximation method can be deployed using the 'Energy Calculator' interface on the EU energy-star website (see Figure 5, below). This enables a user (eg. a City) to assess the energy usage of a device by denoting equipment type (eg. Workstation, Multi-media PC, Imaging Equipment) and its Usage profile (eg. "Average office", "Never switched off" etc),

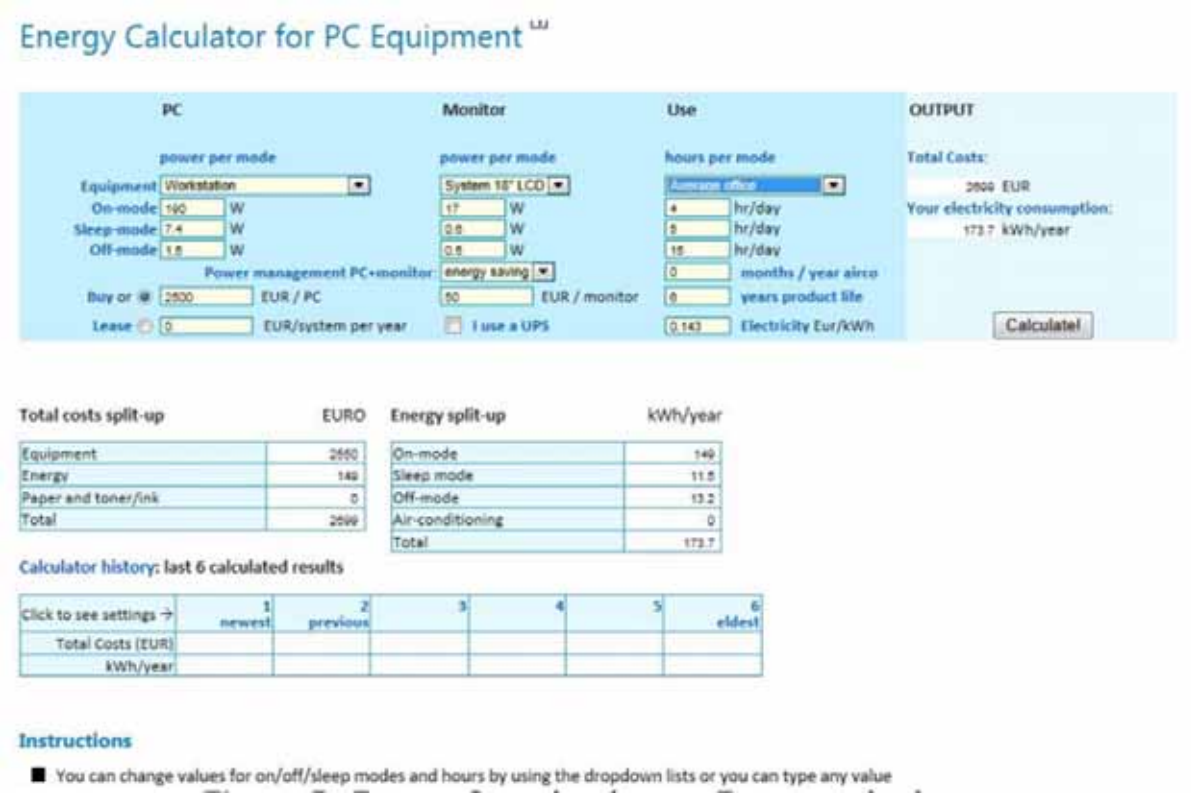


Figure 5: Energy Star database – Energy calculator

Step 5 – Convert the kWh units into a CO_2 rating (ie. kgCO2e) based on the energy conversion factor for grid electricity published at a regional or country level (in the UK this conversion factor is 0.5246[10]). NB. this figure could also influenced by the energy source (eg. this can be 'top-down' average for a City, or alternatively a 'bottom-up' approach based on knowledge of energy sources).

Note : to convert watts (ie. electrical power) into kilowatt-hour (kWh), the formula is "Energy (E) in kilowatt-hour (kWh) is equal to the power (p) in watts, multiplied by the time period (t) in hours divided by 1000"[11] (for example: what is the energy consumption in watt-hour when the power consumption is 5000 watts for time duration of 3 hours?). Answer: E = 5000W × 3h / 1000 = 15 kWh.

Step 6 – Summarise – the findings by Department and City, as appropriate.

Step 7 – Action Plan – detail the actions planned, or need to be undertaken and what effect these will have, and by when, on the City's ICT Footprint.

[10] Based on UK government (ie. Department of Energy and Climate Change) GHG conversion factors.

[11] http://www.rapidtables.com/calc/electric/watt-to-kwh-calculator.htm

17.2.3 Next steps

Cities are advised to repeat the 7-step plan across departments until an overall assessment of the city administration's ICT carbon footprint can be made. It is recommended that the 7-step plan is refined, developed and repeated as the action plans are rolled out.

17.2.4 Visualising ICT Carbon Footprint data

Cities are advised to repeat the 7-step plan across departments until an overall assessment of the city administration's ICT carbon footprint can be made. When the data has been captured to a satisfactory level, it can be uploaded into the Green Digital ICT Carbon Footprint Visualisation tool available on the NiCE toolkit.

The data is shared via a simple spreadsheet.

This spreadsheet should be saved in CSV format and uploaded via the online tool (NB: if not saved in as a .csv file, the spreadsheet will not upload correctly).

Asset	Number Of Unit	Uptime	Standby	Downtime	Consumption	Co2 Emissions	Total Cost
Example: Standard PC	2921	1670.14	-	7089.86	123.55742	144364.4895	204636.6639

Figure 6: Green Digital ICT Carbon Footprint visualisation tool – data upload

Once uploaded, the CSV spreadsheet data will be presented in graphical format.

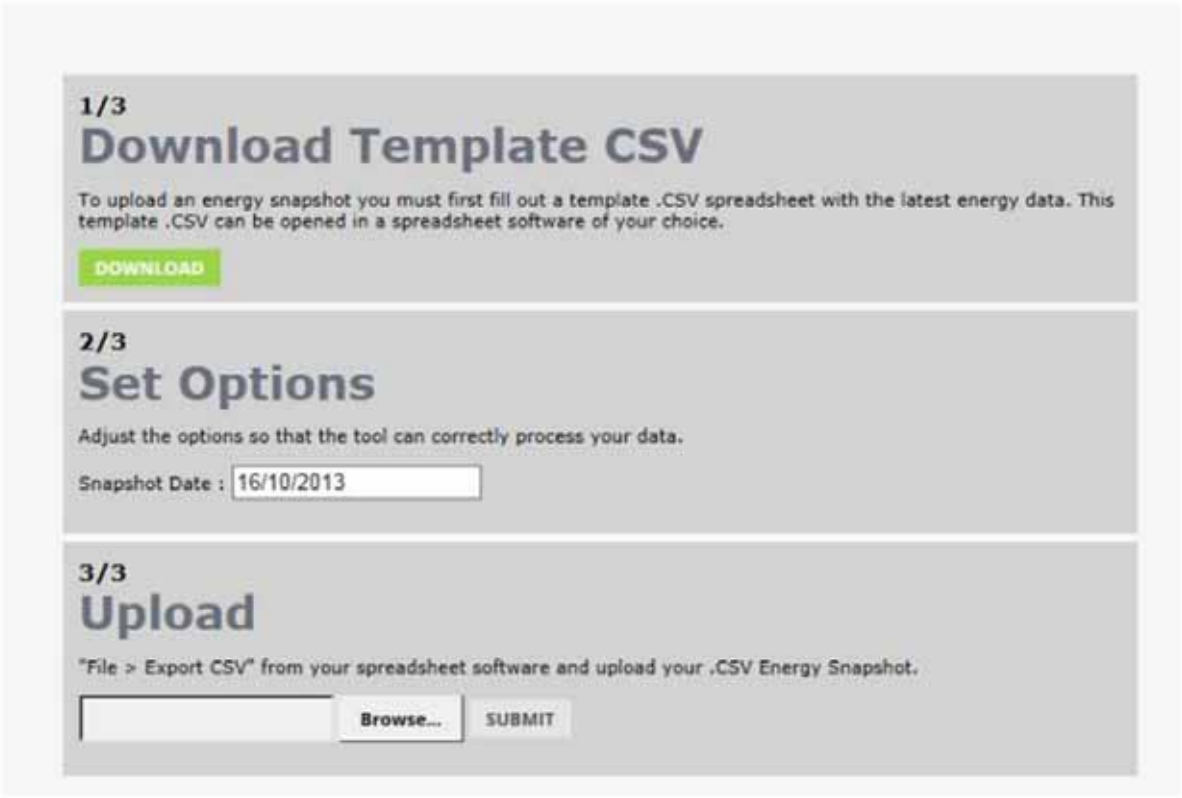


Figure 7: Green Digital ICT Carbon Footprint visualisation tool – data visualisation

The tool works best with 2 or more data uploads across time, to show the changing trajectory of ICT carbon footprint data over time. The tool calculates the % reduction over a 10 year period so cities can see how well they are progressing towards their target 30% reduction.

This visualisation tool should be returned to again and again by cities. It can be used both for analysis and as a visual guide for presentations and political engagement.

17.2.5 Case Study: Linkoping public administration, Sweden

The Green Digital Charter team worked with the ICT Strategy team within Linkoping public administration in Sweden to develop this ICT Carbon Measurement tool.

Linkoping used the 7 step guide and the spreadsheet provided to capture ICT asset data. This is an account of their process.

Step 1 – Organisational Scope:

Linkoping already have an asset register in their city so they were able to cover all departments and organisations that are served by their ICT department in the city and which use the city-wide IP network.

Step 2 – Define the Assets:

Linkoping were able identify ICT equipment across the different departments including the data centre itself. Since Linkoping manage ICT for all their schools, this included all PCs, laptops and tablets used by students and teachers.

Step 3 – Estimate:

Linkoping tried to identify the energy usage of ICT equipment using Symantec utilities but there was a bug in the software so they needed to try another method. They then looked at open source software available on the internet, but no tools suited their purposes. They could identify what ICT equipment was on via their IP network, but they could not work out how long the equipment was on for nor when it was on standby and when it was off. Eventually they wrote a quick software tool themselves, called EasyArp (now available as open source software), which uses ARP tables to identify what equipment is on the IP network. ARP table is read every 30 min and the information stored in a database, on which they could run queries. Since Linkoping use a strict naming convention for host names, they were able to identify the type of equipment being used from the ARP tables and cross-reference it with their asset register. The equipment was grouped into categories rather than by brand/make to make the counting process faster and easier.

Step 4 – Count / Calculate:

Linkoping used the spreadsheet provided to capture the details of the ICT equipment and their time on and off. They added rows and columns to improve their calculations as required. While there is no standardized measure of the actual energy use of ICT equipment, Linkoping identified supplier estimations of energy use and cross-checked this with their own measurements using physical 'off the shelf' plug in monitors. They identified energy use factors for each category of ICT equipment.

Step 5 – Convert:

Linkoping have energy provision from renewable sources so they identified an energy conversion factor in discussion with their national energy metrics team. This metric was included in the spreadsheet to calculate CO2 emissions of the different categories of ICT equipment. The energy use of the data centre was added in as a final item on the spreadsheet based on its energy usage per quarter, found in its energy bills.

Step 6 – Summarise

Linkoping came to some interesting conclusions from looking at their data. Compared to a similar measurement 2008 (Fig 5), they found that their CO2 emissions by 2013 (Fig 6) had dropped even though the number of ICT assets they owned increased in the same period. They attributed this to the more efficient ICT equipment, but also questioned the industry estimates on which they had based their calculations.

Step 7 – Action Plan

Linkoping continue to refine their energy measurement data and are developing action strategies based on their findings.

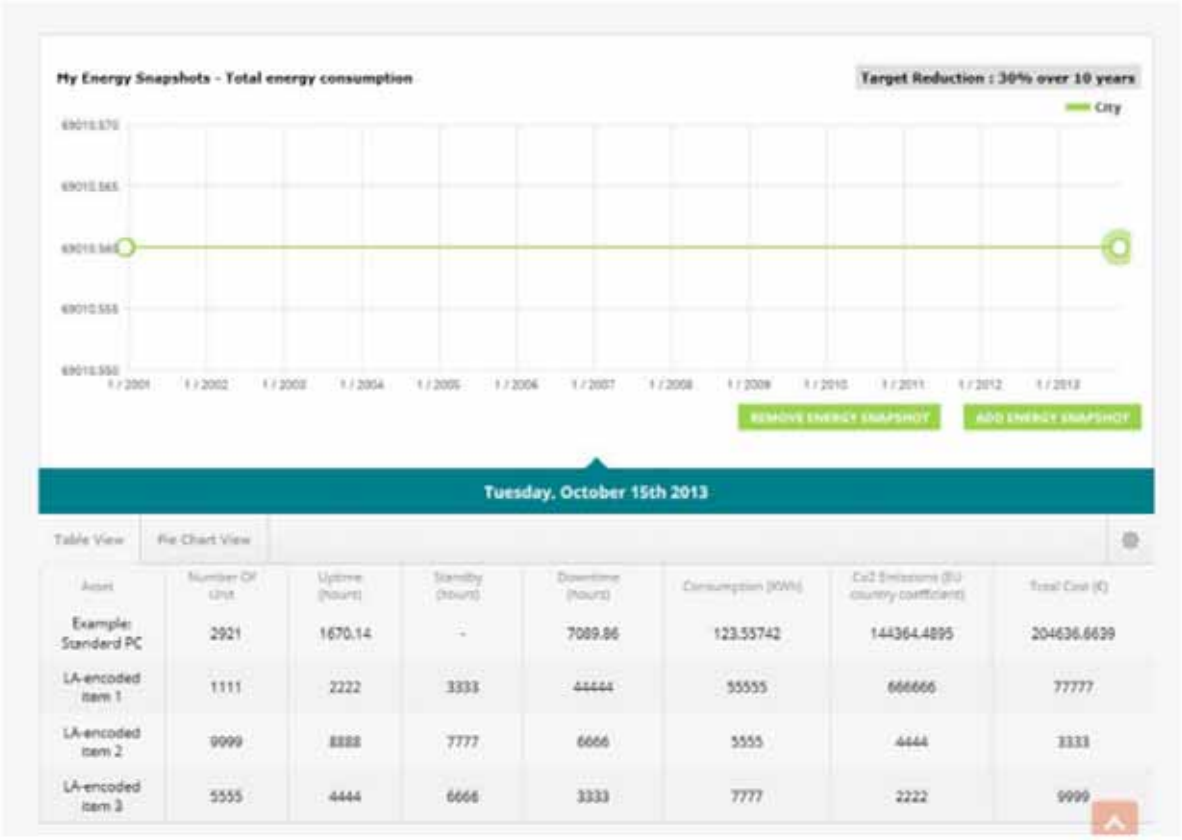


Figure 7: Linköping calculation of 2008 ICT carbon footprint measurements

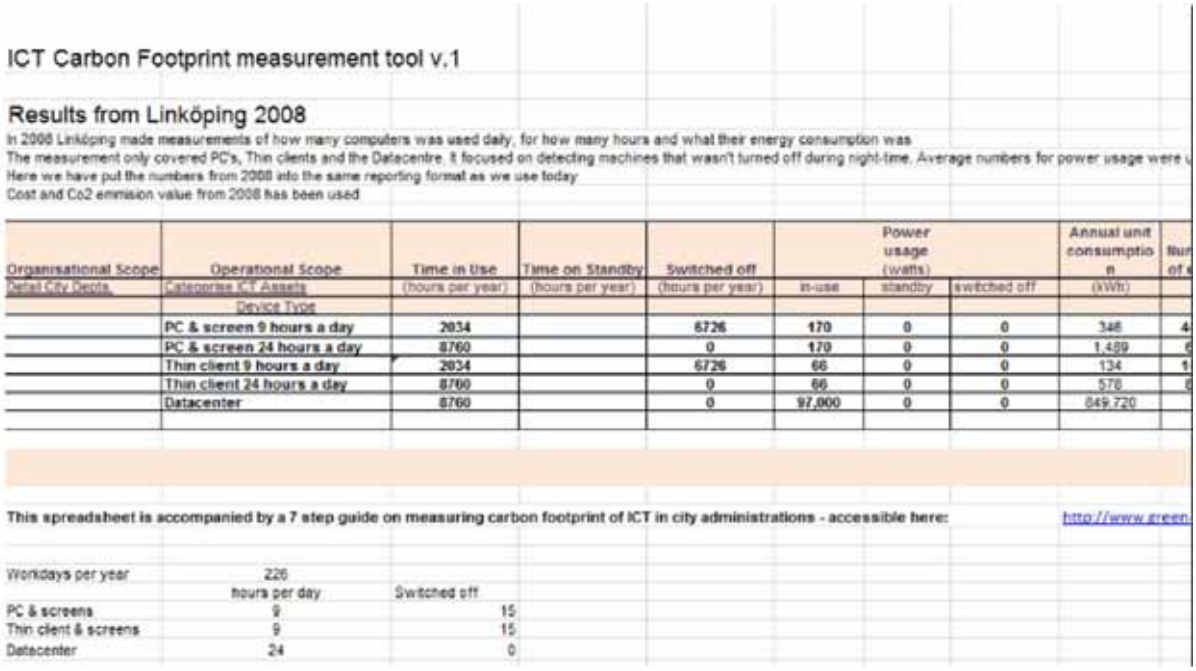


Figure 8: Linköping calculation of 2013 ICT carbon footprint measurements

17.3 Annex A

List of goods to be considered when assessing the impact of ICT activities in organisations (This annex forms an integral part of ITU-T L.1420 Recommendation, and has been reproduced from the ITU-T document)

When emissions due to goods used by the organisation are concerned, the emissions from the following types of goods may be considered. The following list is not exhaustive and shows typical examples:

- Desktops;
- Laptops;
- Cathode Ray Tube (CRT) screens;
- Flat screens;
- Individual printers;
- Cables;
- Network printers and copies;
- Servers, switches and routers;
- Fax machines;
- Scanners;
- Fixed phones;
- Mobile phones;
- Personal Digital Assistants (PDA) and tablets;
- Projectors;
- Videoconference installations;
- Televisions;
- Cooling systems for ICT goods;
- Other small ICT goods;
- Outsourced ICT goods, in particular outsourced datacentres;
- Power supply back-up generators.

It should be noted that these generators systems have to be dedicated to the ICT goods in this list. Otherwise an allocation approach would need to be used if the generators system is used for more than the ICT goods. The same remark applied for the cooling systems for ICT good mentioned above.

17.4 Annex B

EU ENERGY STAR qualified office equipment

EU database description

This EU Energy Star database (www.eu-energystar.org) contains only products that are available in the EU. It is based on the US EPA database (for products available in the EU) plus products that are directly registered with the EU, managed by the European Commission. For (legal) disputes the lists of qualified products downloadable from the above website (for the EC) and from www.energystar.gov (for the US) are applicable. The database is intended to make the registered products more accessible.

The database shows energy consumption and main performance data as supplied by the manufacturers. Pictures (100 x 100 pixels) and brand-specific websites (if available) for the most recent models of ENERGY STAR qualified equipment are added.

How to Use

- Click on one of the main categories in the right menu or in the dropdown-menu above.
- A selection form for the category will appear, allowing you to select various product features.
- You can also limit your query by choosing product-specific **ATTRIBUTES** and specific **BRANDS**. If none are selected, then all models will be shown. The total number of models in your selection is indicated in the **Results** line.
- After pressing the **Search Database** button a table containing the models in your selection will appear. The data-rows in this table can be **sorted** in ascending or descending order on a maximum parameters in the headers by clicking red (first sort order) and blue (second sort order) triangular buttons.
- To view **Pictures** and website-URLs of selected models (only recent EU), use the checkboxes at the beginning of each row and then click the **View** button at the top of the first table-column. You will then see the new table with just the selection and the pictures.
- To return to previous tables use the **Back** button at the top of the page.

Green Digital Charter

Toolkit User Manual

http://www.greendigitalcharter.eu/toolkit

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