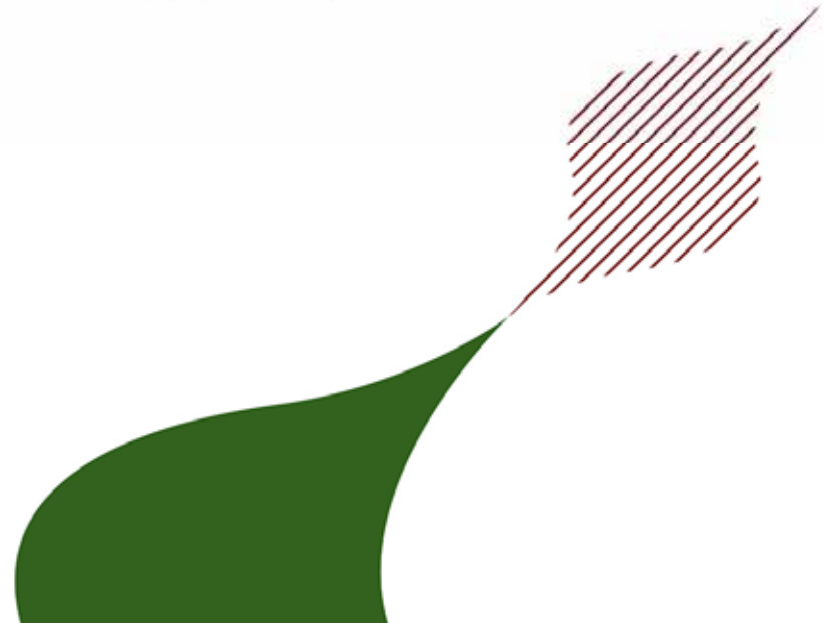




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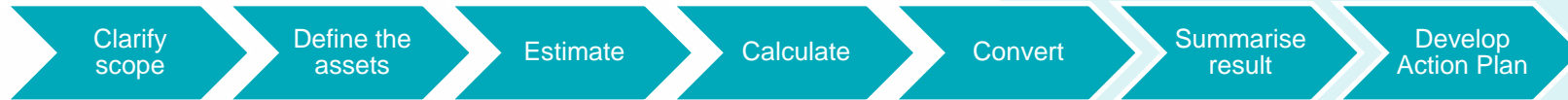
ICT Carbon Footprint Tool

*Proof of Concept
Linköping 2013*



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ICT Carbon Footprint tool: Step-by-step



1. Clarify organisational scope
2. Define ICT assets
3. Estimate number of assets according to type
4. Calculate energy usage from estimation
5. Convert energy usage to carbon emissions data
6. Summarise results
7. Develop action plan to reduce emissions

Repeat process bi-annually...

Step 1 – Organisational scope

- All ICT-equipment delivered from the internal ICT Department is included in the measurement scope
 - All departments within the municipality
 - Municipal companies also included
- Private or non-standard equipment is not included



Step 2 – Define the assets

- Assets included:
 - Computers, all categories incl. thin clients
 - Network printers
 - Communication equipment (datacenter)
 - Fixed IP phones
 - Datacenter (servers, cooling, UPS and so on)
 - Assets to be included:
 - Switches & routers on each location
 - Mobile phones*
 - Tablets*
 - Video projectors
 - Local printers
- * only connects to the visitors WiFi today

Step 2 – Define the assets, summary

Desktops	Measured today
Laptops	Measured today
Cathode Ray Tube (CRT) screens	N/A
Flat screens	Measured today
Individual printers	To be measured
Cables	N/A
Network printers and copies	Measured today
Servers, switches and routers	To be measured
Fax machines	To be measured or N/A (we have very few)
Scanners	Measured today
Fixed phones	Measured today (IP based)
Mobile phones	To be measured
Personal Digital Assistants (PDA) and tablets	To be measured
Projectors	To be measured
Videoconference installations	N/A
Televisions	To be measured or N/A (we have very few)
Cooling systems for ICT goods	Measured today
Other small ICT goods	N/A
Outsourced ICT goods, in particular outsourced datacenters	Measured today
Power supply back-up generators	Measured today for Datacenter. Additional equipment exists

Step 3 - Estimate

- All IP-based equipment is inventoried using a custom application - EasyArp
 - Gathers information from network switches (collects ARP tables every 30 min and stores in a database)
 - Counts number of units and up time per connected unit
 - Demands a good naming standard to easy up categorization of units
 - The EasyArp Application has been developed for this project
- Non-IP-based equipment or equipment not connected to the internal network, is identified from the asset register, added to the inventory and 'up time' is estimated
- Datacenter is measured separately – we just look at the bill

Free to use!



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Step 4 - Calculate



- We Googled the Internet to find out energy usage information for each unit
 - Vendors have this information available online
 - We did not use the Energy Star database, due to lack of information on specific models
- Vendors specifications was verified with manual measurements
 - Differences were discovered
 - Some units used 40 % more than specified

Step 5 – Convert

- Linköping City Council has decided that the formula 400 g CO₂/1 kWh (EU average) shall be used when converting kWh to CO₂ emissions



Step 6 - Summarize

- Measurements have been summarized for the entire municipality and municipality companies
 - Total energy usage **2 353 915 kWh**
 - Converted to CO₂ = **941 tonnes**
 - Cost = **146 000 euro** (1 249 698 SEK) + **taxes**
- Dividing the measurement on different departments demands more effort, but is possible
 - IP subnets are mapped to each department
 - Useful when individual departments are analyzed

ICT Carbon Footprint Spreadsheet

- Measurements from 2008
- Measurements from 2013

(see sep. spreadsheets)



Step 7 – Action plan

- Our action plan is a continuous process
 - Started 2004 and is still running...
- Compared to a similar measurement made in 2008:
 - Linköpings has reduced the total ICT energy usage by more than 50 %
 - The reduction has taken place even though the number of computers has increased from 6 000 to 10 000 units
 - Reason; computers use less energy and sleep mode functions work better today

Conclusions:

- first decide why to use the model
- The ICT Carbon Footprint Tool works!
 - Provides a good basis for further planning and actions
- But, first you need to decide why to use the model?
 - The purpose is the input to define the scope
 - The Footprint Tool gives you knowledge, and...
 - ...the output is input to the action plan

Conclusions:

– input from different sources needed

- Different sources and tools are needed:
 - Asset Register
 - Configuration Management DB
 - Inventory applications, like the EasyArp
 - Energy Star is not good enough, lack of information
 - Vendors energy usage data are available on the internet, but manual measurements are needed to verify usage
 - A good name standard easy up (EasyArp)
 - Green electricity gives better CO₂ values.

Conclusions:

– outcomes

- We needed to find a proper and generic tool to use for inventory of assets (the EasyArp application was dev.)
- We realized that we had to calculate and use averages, instead of specifying data for each unique model, due to;
 - the fact that EasyArp cannot identify which model is being used
 - knowing no of units of each specific model was irrelevant for our purpose

Thanks for
your attention!

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