

How to find Activity Data

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Activity data

- **Activity Data**

- statistics (census, survey...)
- measurements
- model results
- expert judgement
- ...

$$\boxed{\text{AD}} * \text{EF} = \text{Emission}$$

- **Obtaining good quality of Activity data (AD) is crucial for all emission inventories**

What criteria should meet good AD sets?

- Completeness (all sources, all regions, time series,...)
- Consistency
- Timeliness – (be ready on right time)
- Appropriate level of detail (subcategories, regions,..)
- Unbiased (V&V and/or QA/QC plans in place)
- Low uncertainty
- Transparency (documentation, archiving)

Priorities may change with the purpose for which the inventory is compiled

Data collection

- **The information to be put together annually is huge and is gradually increasing** with new requirements on emission reporting
- **Formalised data collection routines have to be established to keep system sustainable and to guarantee availability of AD on annual bases and in real time**
- **Archiving and documentation of AD is essential to make the inventories transparent, trustful, improvable,...**

Preconditions for Establishing Sustainable System for AD Collection

- **Setting up priorities** – focus on most important sources
- **Developing data collection strategies** – (short & long term plans)
- **Communication and establishing good relationship with data providers**
- **Collecting data regularly**
 - Collect data at the level of detail where emissions are calculated (e.g. the same EF)
 - Review AD on regular bases; (V&V, QA/QC)
- **Documentation and archiving all AD, background information as well**

Setting up priorities

- **Complete/update list of source/sink categories for your country and identify important ones** (Importance of source categories may differ between gases / pollutants)
 - Key source analyses,
 - Look at neighbour countries
 - Regional /world statistics emission per capita...
- **Check availability of activity data needed for each source /sink category . Possible constraints e.g. :**
 - data are available and accessible as needed
 - data are available but e.g.; not in requested structure, not complete, high uncertainty,...
 - data are in country but not accessible for the inventory team
 - data will be available but late
 - data missing
- **Allocate resources** (budget and expertise) **and check for deadlines**
- **Elaborate plan /strategy for obtaining data**

Developing AD Collection Strategy - Planning

Assess status, determine priorities and assign staff responsibility

- **What** (is to be collected) – AD for specific source categories
 - E.g. energy statistics, animal statistics, waste production...
 - Harmonisation of different requirements is essential
- **Where** (Source of the information)
 - E.g. statistical office, ministry of economy, municipalities, industries,....
- **Who** (will approach different data providers)
 - E.g.: MoE, Leading inventory Institution, Consultants,...
- **How** - procedural, institutional, legal, arrangements (e.g. what protocols does exist in the country for data acquisition, identification of new procedures to be established,..)

Requirements, obligations (WHAT)

- **Number of emission inventories are to be complete annually for :**
 - international obligations like CLRTAP and protocols, UNFCCC, EU directives, local authorities, models,...
 - **Gases/pollutants** - e.g. ozone precursors, SO₂, ammonia, GHGs, HM, POPs, particulate matter, PCBs...

AD - Level of detail (WHAT)

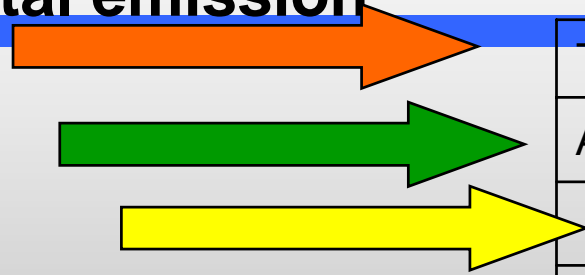
- **0 level=Total emission**

- **1st level**

- **2nd level**

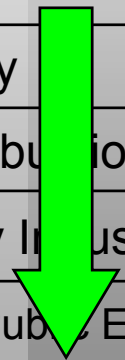
- **3rd level**

- **4th level**



Total Agriculture	328
A Enteric Fermentation	278
1 Cattle	226
2 Buffalo	0
3 Sheep	43

Total Energy	108 048
A Fuel Combustion Activities (Sectoral Approach)	108 048
1 Energy Industries	54 736
a Public Electricity and Heat Production	
b Petroleum Refining	
c Manufacture of Solid Fuels and Other Energy Industries	



- **Nth level Large point sources**

Typical Data Sources in Country (Where)

- **National Statistical Agency**
- Industrial associations, trade associations
- Enterprises
- National Regulatory Authority
- Ministries, Agencies
- Custom administration
- Local governments
- Municipalities
- Universities
-

International data sources (examples)

(Where)

● ENERGY

- IEA (production, transformation, consumption), UNSD (energy statistics and energy balance), world bank, OECD,
- ICAO, IATA (air transport)
- CDIAC , EDGAR partial info on fugitive emissions

● Industrial processes, product use

- Eurostat and UN (production in physical units), OECD (production in monetary units)

● Agriculture, Nature, Forestry

- FAO (animal statistics, fertilizer use, agriculture production,..)

● Waste

- Eurostat, OECD, UN (limited information, not annual data)

Steps when gathering existing AD (HOW)

- Delegation of responsibilities
- Initial screening of data availability
- Specification of data requirements (years, subsectors, units, uncertainty information..)
- Specification of format, structure and time schedule
- Communication with stakeholders
- Collection of AD
- Review of AD
- Documentation & archiving of AD

Communication with stakeholders (How)

- **Target groups:**
 - government (backstopping, legal support), local authorities
 - data providers
- **Explain what is needed and why**
- **Submit your requirements in easy-to-understand form (tables, definitions), and in time**
- **Explain what advantages can have good set of AD for provider, government, local authorities,.. (e.g good fuel consumption data are foundation for analysis of a range of energy and environmental issues, abatement strategies, emission trading....)**
- **Praise received information, cite source**
- **Elaborate protocols for treating restricted data (Sign confidentiality agreement, Agree level of data aggregation,..)**
- **Perform awareness activities (seminars, trainings, media events,...)**

Steps when filling gaps in AD (HOW)

- **Identification of data gaps and allocation of problems**
- **Checking alternative data sources**
 - Try international agencies (IEA, FAO, OECD,..)
 - Examine Surrogate data /drivers
- **Selecting methods for filling gaps in AD**
- **Filing gaps,**
- **Checking AD**
- **Documentation & archiving of AD and background information**

Methods for filling gaps in AD sets (HOW)

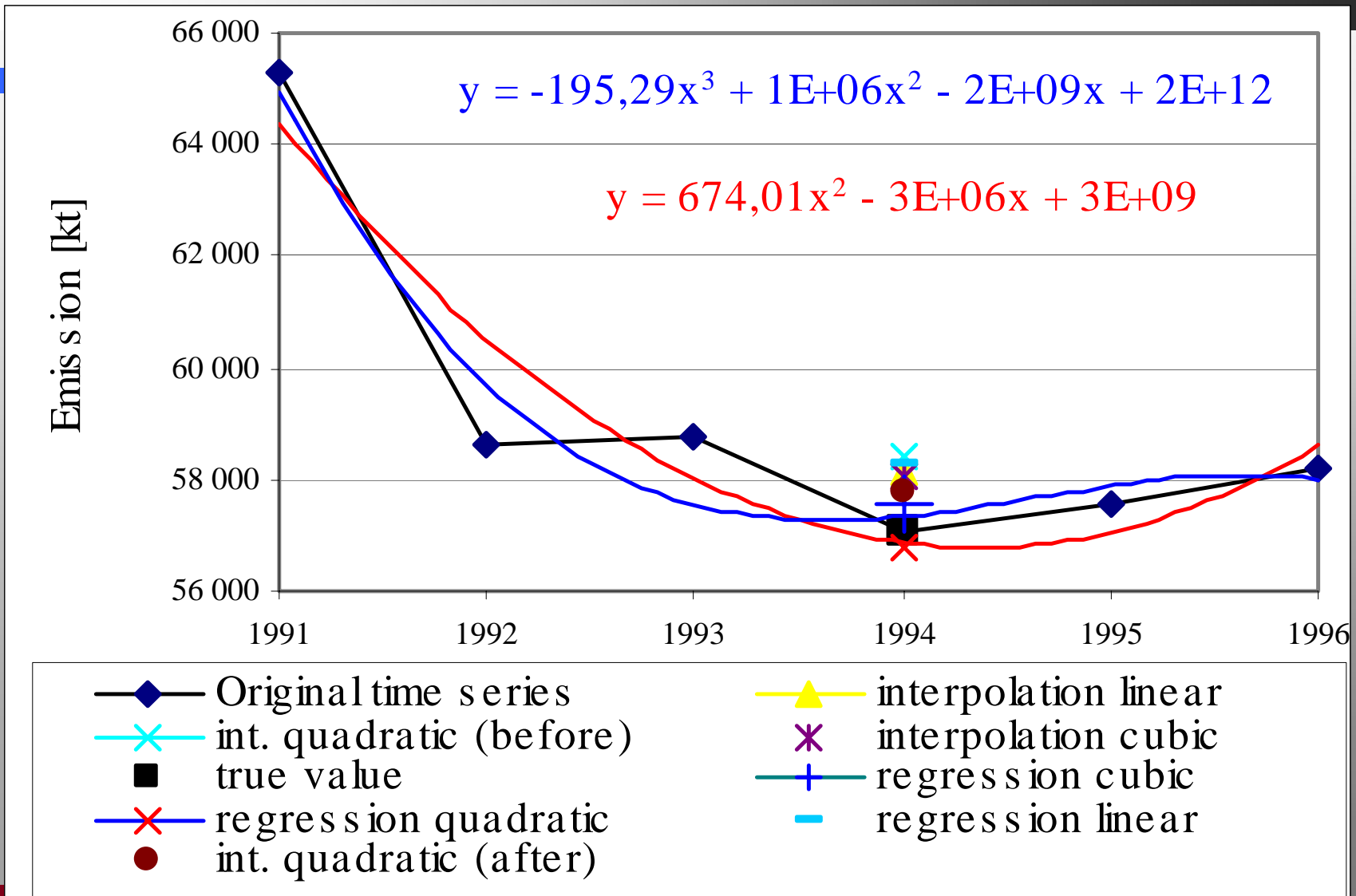
- **Different type of problems to be solved:**
 - Non-calendar year data
 - Not complete time series
 - Not complete AD – e.g. only for 6 from 10 enterprises
 - No uncertainty information,
 - Big uncertainty of data
 - Not consistent data set
- **Numerical methods**
 - Weighted average
 - Extrapolation, interpolation
 - Regression
 - Models
- **Expert judgement**
- **Default values, drivers, surrogate data**
- **Combination of all**

Example: Reconstruction of Time Series – Mathematical and Empirical Methods

- **Interpolation/Extrapolation-Newton formula**
 - Equivalence of function values $f(x_i) = P(x_i)$
- **Regression: linear, quadratic, cubic**
 - minimization of sum of squares $(f(x_i) - P(x_i))^2$
- **Approximation using drivers, examples:**
 - GDP → Electricity production/consumption
 - GDP → Total Emission from Fuel Consumption
 - Fossil electricity production → Emission

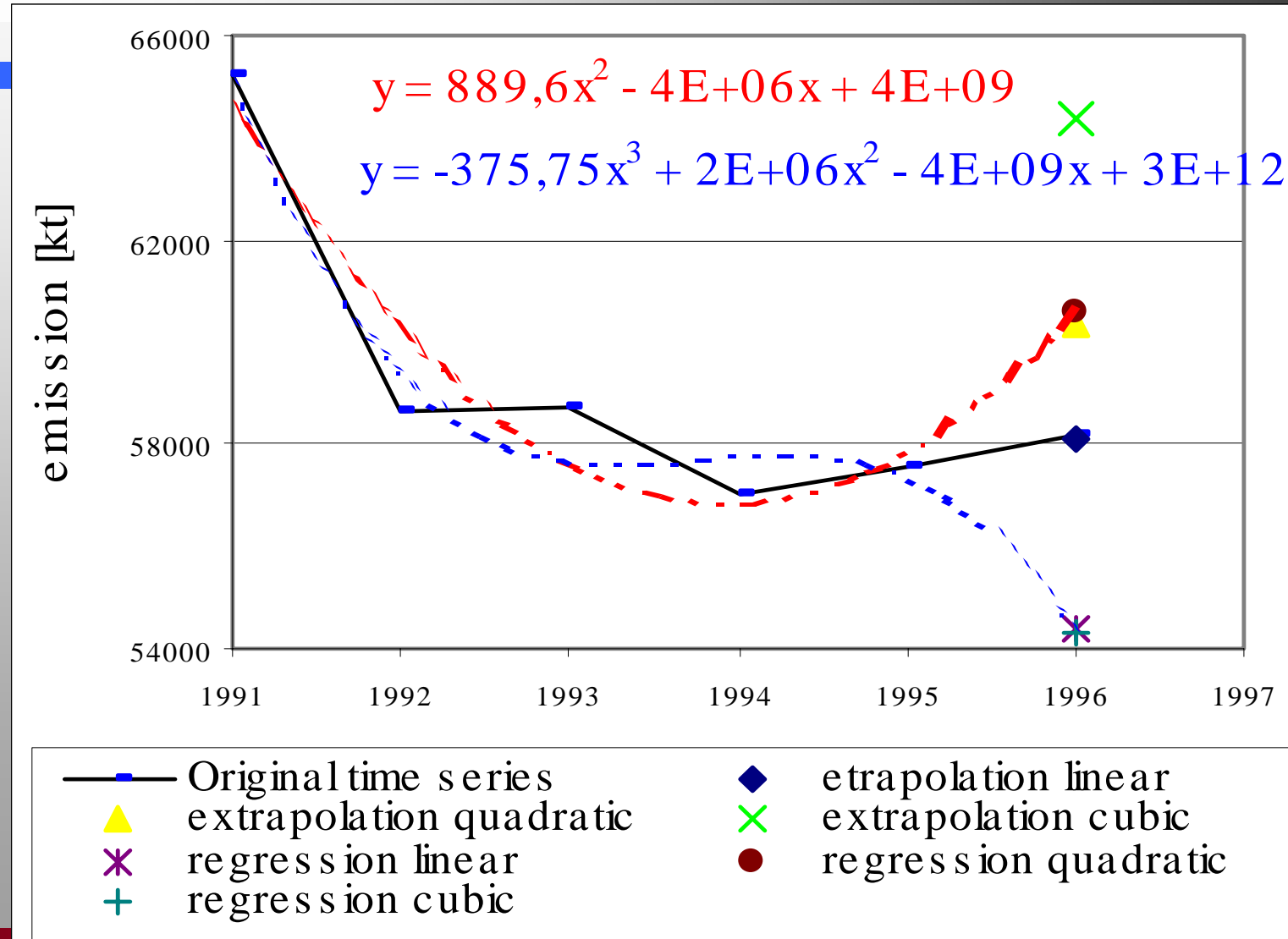
Mathematical Methods – Interpolation

M.Tichy for UNDP training



Mathematical Methods - Extrapolation

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Generation of new data (HOW)

- **Method will depend on importance of source, character of data, availability of time and resources,...**
- **Options**
 - **Models**
 - **Measurements**
 - **Surveys, (Census)**
 - **Expert judgement**
 - **Communication with stakeholders**

Expert judgement (HOW)

- **When - to fill the data gaps, obtain uncertainty information**
- **How – in transparent manner, appropriately documented (standard format-protocol)**
- **Possible bias in expert judgment**
 - Representatives
 - Insufficient adjustment
 - Desire to influence the result e.g. to avoid contradicting prior position

Developing AD collection Strategy - Steps

- Establish coordinating agency, experts, steering body...
- Assess current status
- Harmonise requirements
- Include time schedule
- Provide sector specific guidance
- Include contacts, addresses,...
- Plan validation & verification of AD
- Identify areas to be improved in the future, new routines to be invented...
- **Strive to make from “AD collection strategy” a (legally) binding document (processes ISO9001, NIS, decree, memorandum of understanding...)**

Documentation and archiving

● Documentation

- collection of information on sources of the used data, and methods and „background“ leading to conclusions
- the way how to persuade a reader or reviewer of a report that my data and conclusion are correct

● Archiving

Storage of all (initial sets of AD), background information and revised sets of AD as well

- to enable a follower to check all my steps and learn from my achievements and failures
- to enable any recalculations

Documentation and archiving systems

- Delegate responsibilities
- More is better! **But „heap-like“ archive complicates access to individual documents**
- **Make an easily understandable system**
- **Archive all „source materials“ (books, journals, reports, expert judgment protocols, communications!!,....)**
- **All AD have to be referenced**
- **Exception may be books and journals available in many public libraries**

How to find AD - Conclusions

- **Permanent awareness raising on importance of good AD with government and other stakeholders**
- **Build up good relationships to data providers**
- **Build up good inventory team, delegate responsibilities, harmonise efforts**
- **Elaborate ST< strategies for AD collection**
 - Set up priorities
 - Harmonise requirements
- **Formalise the system to the extend possible**
- **Be creative**