

Time Series Consistency

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Time Series

- An inventory is not just an estimate of a single year. It includes estimates for a number of years (time series of estimates)
 - Information on historical emissions trend
 - Tracking the effects of strategies to reduce emissions at the national level
- Annual estimates should be comparable
 - Should reflect the real annual fluctuations in emissions and removals
- Therefore, emissions and removals in time series should be estimated consistently
 - Use of the same method and data sources in all years, where possible
- However, it is not always possible to use the same method and data sets for the entire time series due to a lack of data

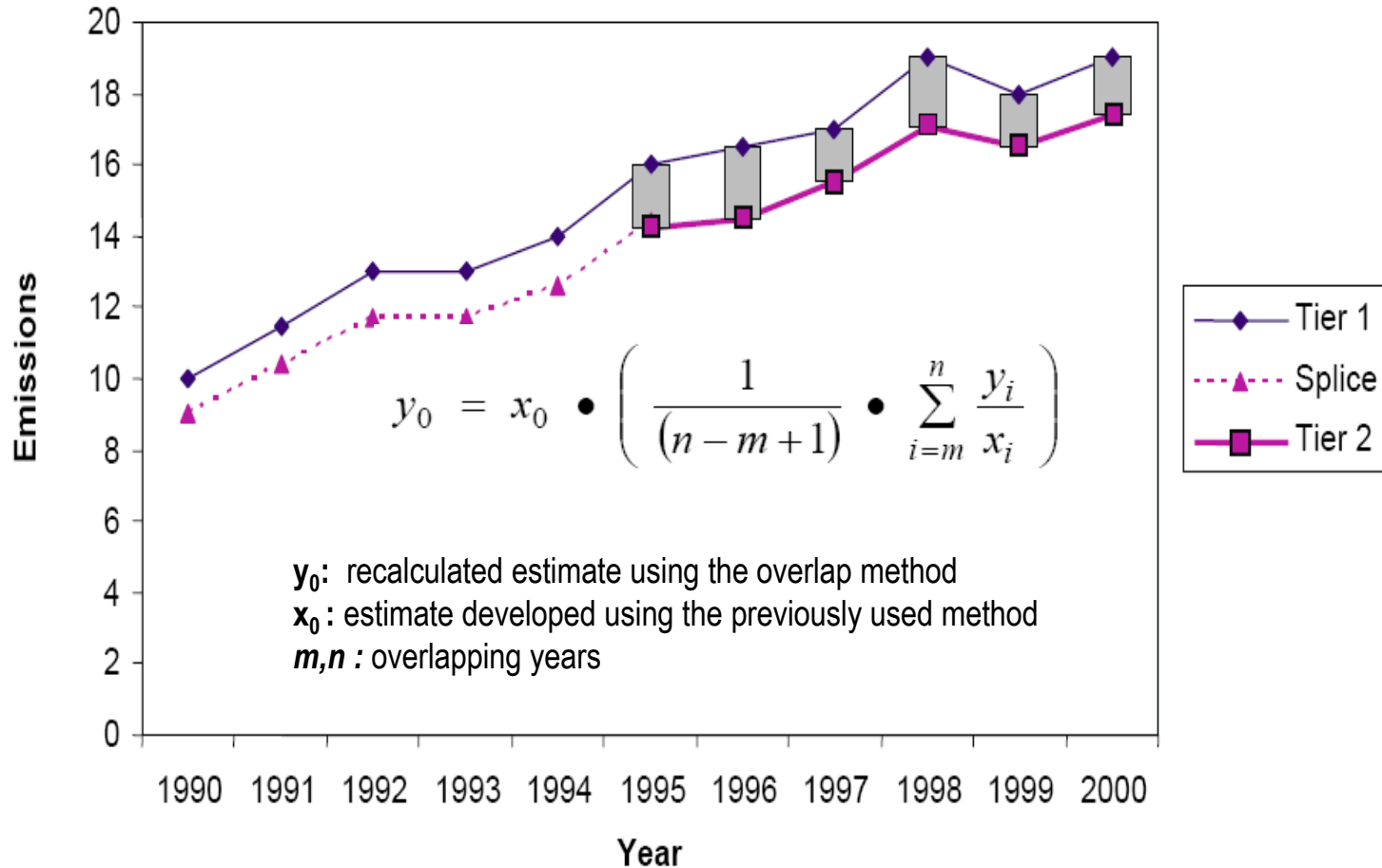
Splicing Techniques

- Splicing: combining or joining of more than one method or data series to form a complete time series
 - Methodological change and refinement
 - Data gaps
- The 2006 IPCC Guidelines provide several splicing techniques
 - Overlap
 - Surrogate
 - Interpolation
 - Extrapolation
- Selecting a technique requires an evaluation of the specific circumstances and a determination of the best option for the particular case

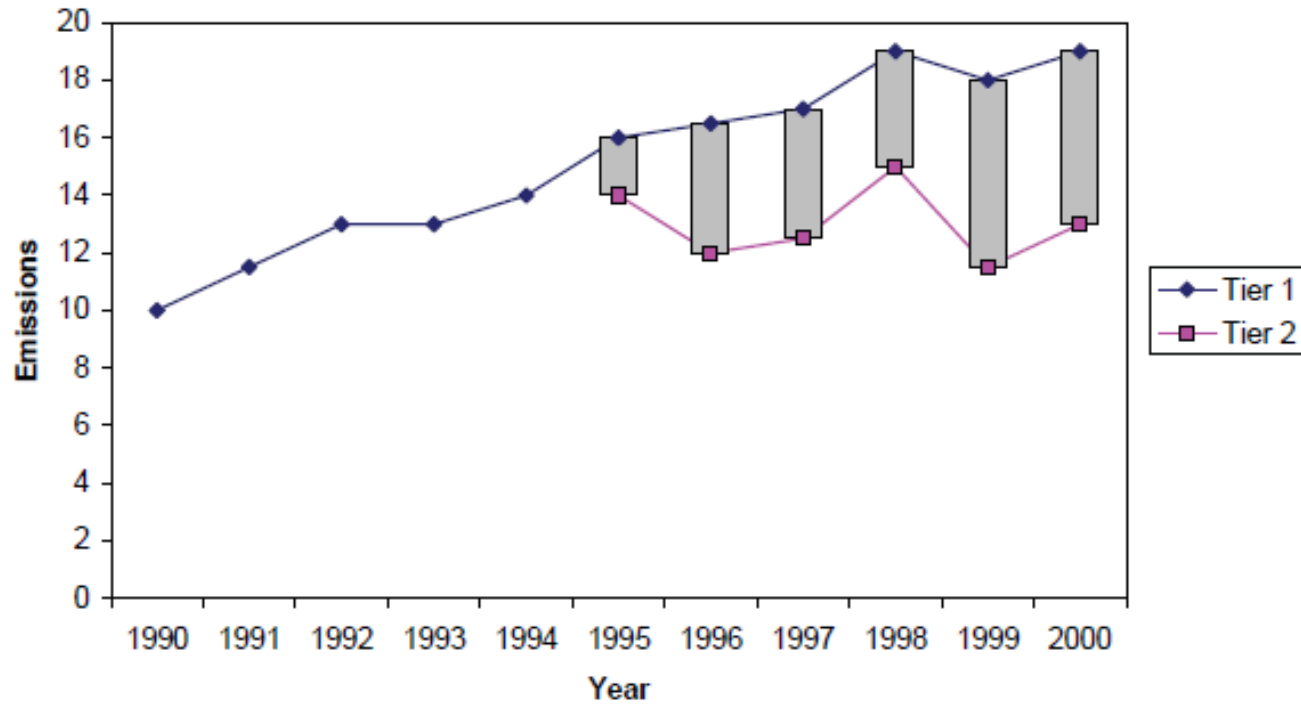
Overlap

- When a new method is introduced but data are not available for early years in the time series (e.g. implementing a higher tier methodology)
- Develop a time series based on the relationship (or overlap) observed between the previously used and new method during the years when both can be used
- It is preferable to compare the overlap for multiple years to evaluate the relationship between the two methods
- If there is no consistent overlap between methods and it is not good practice to use the overlap technique

Overlap: Consistent Relationship



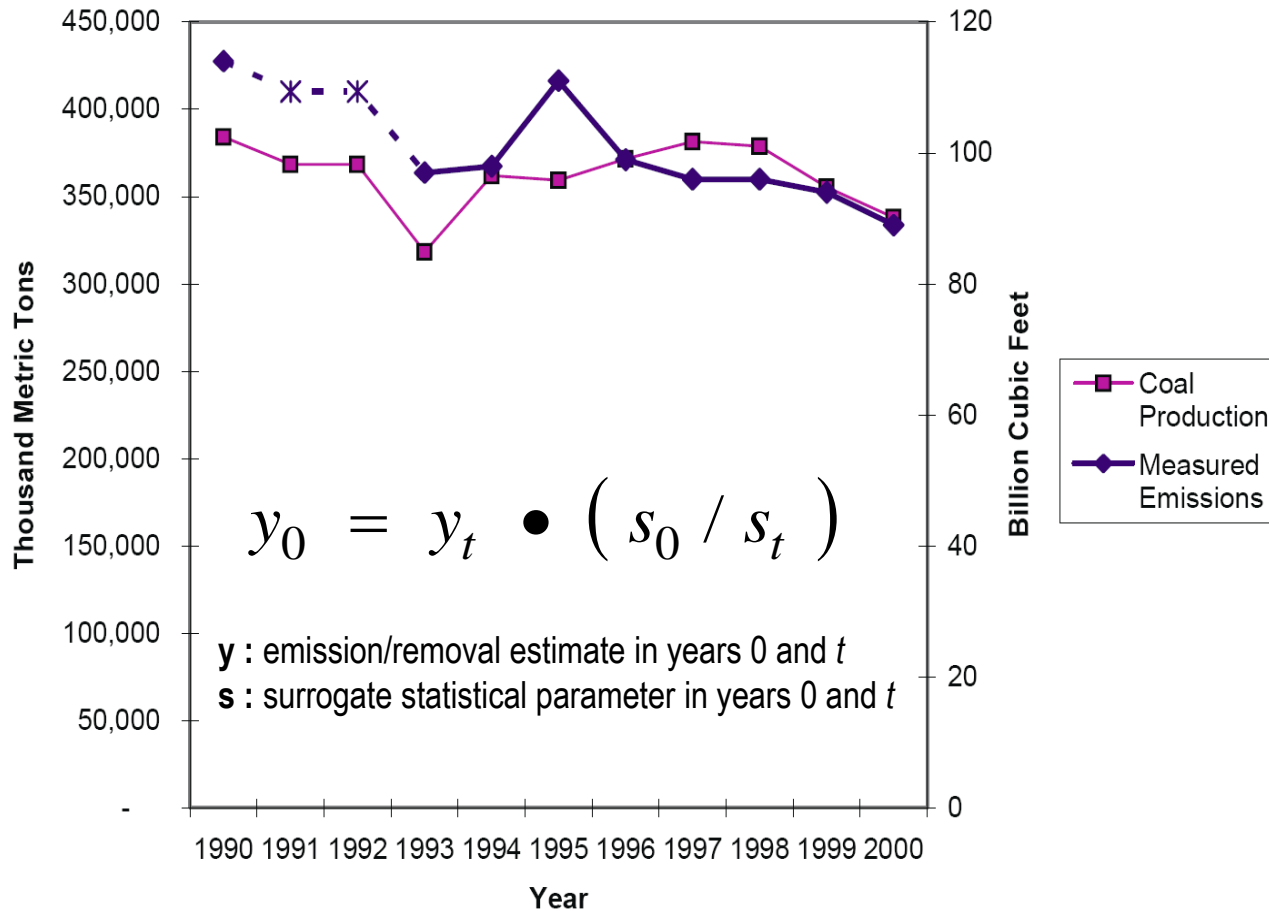
Overlap: Inconsistent Relationship



Surrogate Data

- The surrogate method relates emissions or removals to underlying activity or other indicative data
 - Data (statistical) that is related to the emission (emissions may be proportional to production, vehicle distances travelled and population etc.)
- Although the relationship between emissions/removals and surrogate can be developed on the basis of data for a single year, the use of multiple years might provide a better estimate

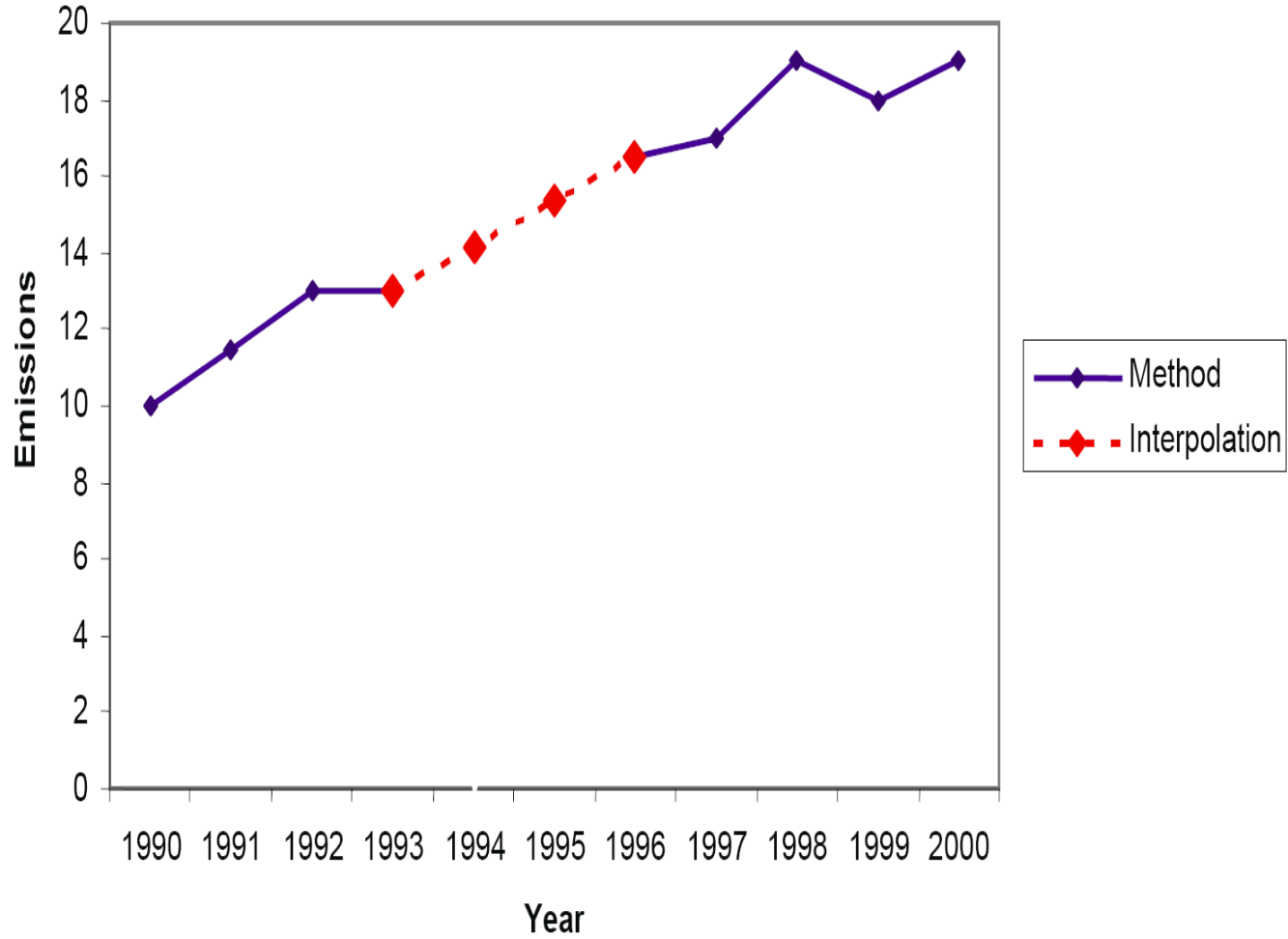
Surrogate Data



Interpolation

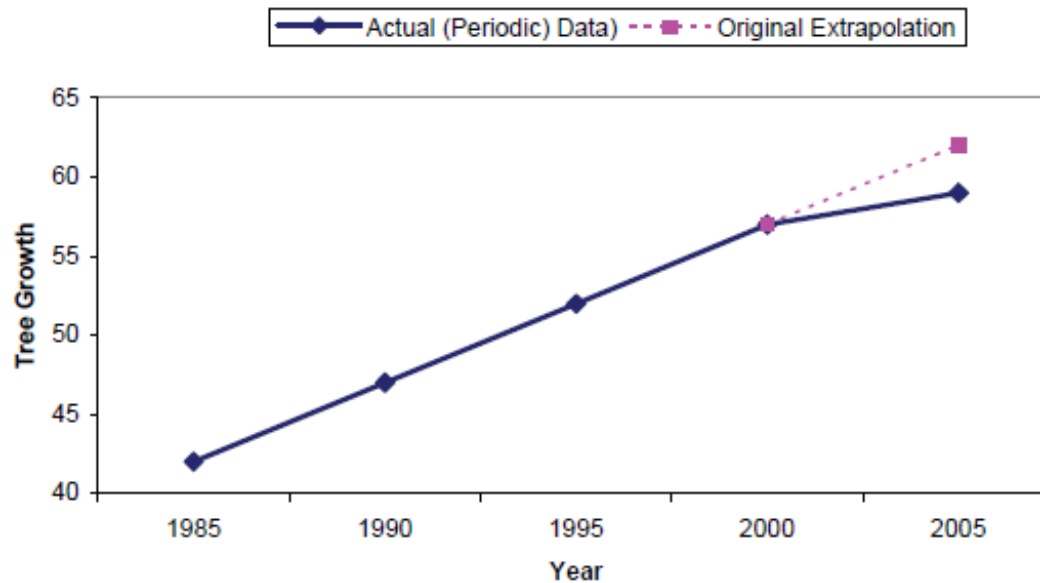
- When detailed statistics is collected every few years, or it is impractical to conduct detailed surveys on an annual basis
- Estimates for the intermediate years in the time series can be developed by interpolating between the detailed estimates when:
 - Overall trend appears stable
 - Actual emissions are not substantially different from the values estimated by interpolation
- If information on the general trends or underlying parameters is available, then the surrogate data can be used
 - It is good practice to compare interpolated estimates with surrogate data as a QA/QC check

Interpolation



Extrapolation

- When data for the base year or the most recent year are not available
- The data can be extrapolated assuming that the trend in emissions/removals remains constant over the period of extrapolation
 - Should not be used if the trend is not constant over time.
- Analyse the character of trend – e.g. linear or more complex



Summary of Splicing Techniques

- Each technique can be appropriate in certain situation. It is good practice to perform the splicing using more than one technique before making a final decision

Approach	Applicability	Comments
Overlap	Data necessary to apply both the previously used and the new method must be available for at least one year, preferably more.	<ul style="list-style-type: none"> Most reliable when the overlap between two or more sets of annual estimates can be assessed. If the trends observed using the previously used and new methods are inconsistent, this approach is not <i>good practice</i>.
Surrogate Data	Emission factors, activity data or other estimation parameters used in the new method are strongly correlated with other well-known and more readily available indicative data.	<ul style="list-style-type: none"> Multiple indicative data sets (singly or in combination) should be tested in order to determine the most strongly correlated. Should not be done for long periods.
Interpolation	Data needed for recalculation using the new method are available for intermittent years during the time series.	<ul style="list-style-type: none"> Estimates can be linearly interpolated for the periods when the new method cannot be applied. The method is not applicable in the case of large annual fluctuations.
Trend Extrapolation	Data for the new method are not collected annually and are not available at the beginning or the end of the time series.	<ul style="list-style-type: none"> Most reliable if the trend over time is constant. Should not be used if the trend is changing (in this case, the surrogate method may be more appropriate). Should not be done for long periods.
Other Techniques	The standard alternatives are not valid when technical conditions are changing throughout the time series (e.g., due to the introduction of mitigation technology).	<ul style="list-style-type: none"> Document customised approaches thoroughly. Compare results with standard techniques.

Quality of Time Series and Documentation

- Comparison of the results of multiple approaches where it is possible to use more than one approach
 - Plotting and comparing the results of splicing techniques on a graph is useful
 - If alternative splicing methods produce different results, should consider which result is most realistic
- Comparison of recalculated estimates with previous estimates can be a useful check on the quality of a recalculation
 - However, higher tier methods may produce different trends than lower tier methods because they more accurately reflect actual conditions
- All recalculations and measures taken to improve time series consistency should be documented and reported
 - Reason of the recalculation
 - Effect of the recalculation on the time series
 - Splicing techniques used

Summary

- **We need consistent estimates of emissions/ removals for all years**
 - Same method and data sources should be applied to all years, if possible
- **Where this is not possible, inventory compilers should follow the time series consistency guidance to provide consistent estimates for all years**
 - Overlap/ Surrogate / Interpolation / Extrapolation /etc.
- **We need to ensure quality of time series**
 - Quality checks are applied to entire time series
- **All decisions, methods and reasons should be documented**

Thank you