

LCA Impact Pathways & Time-Lags

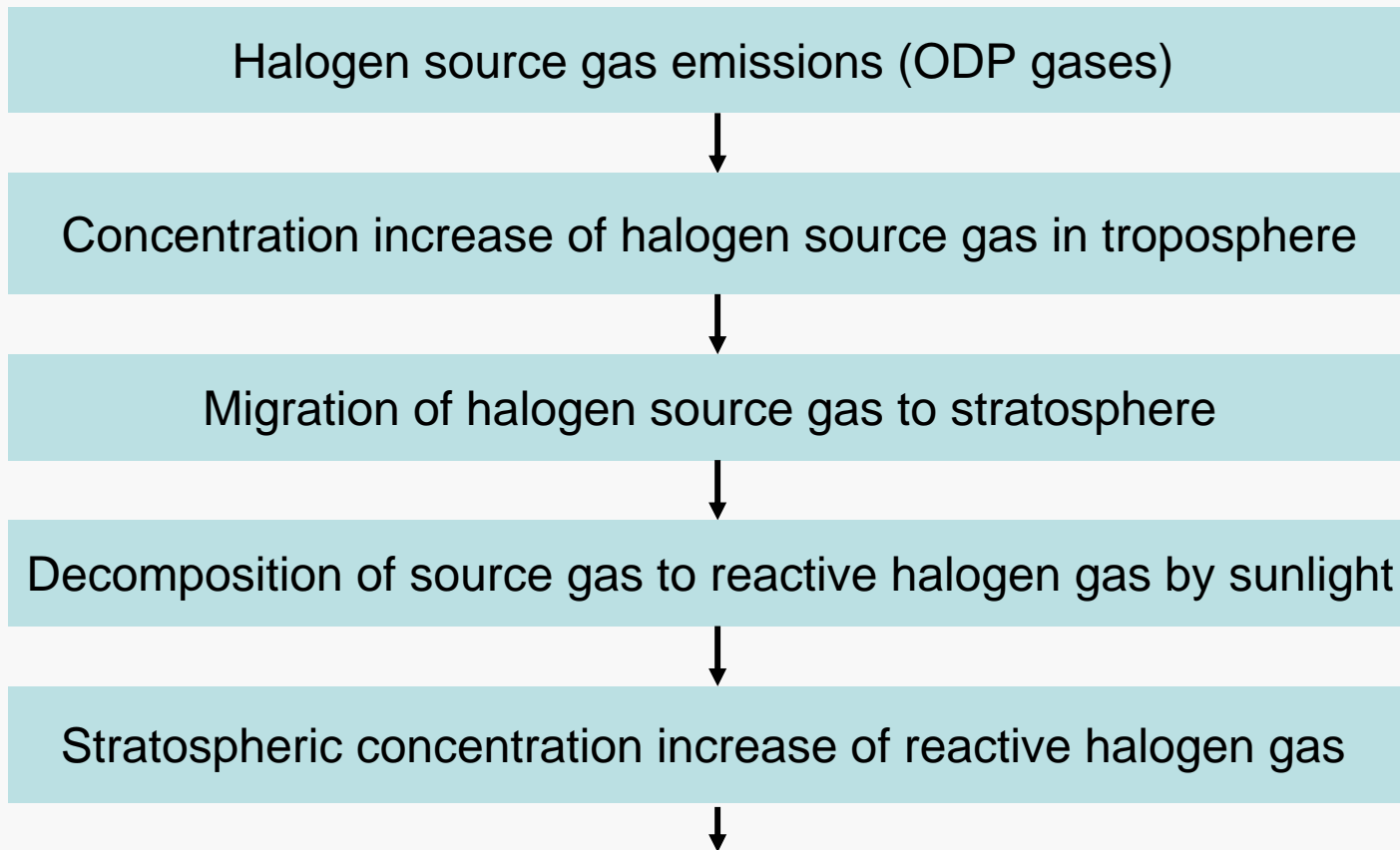
An Overview

Patrick Hofstetter
Ruedi Müller-Wenk

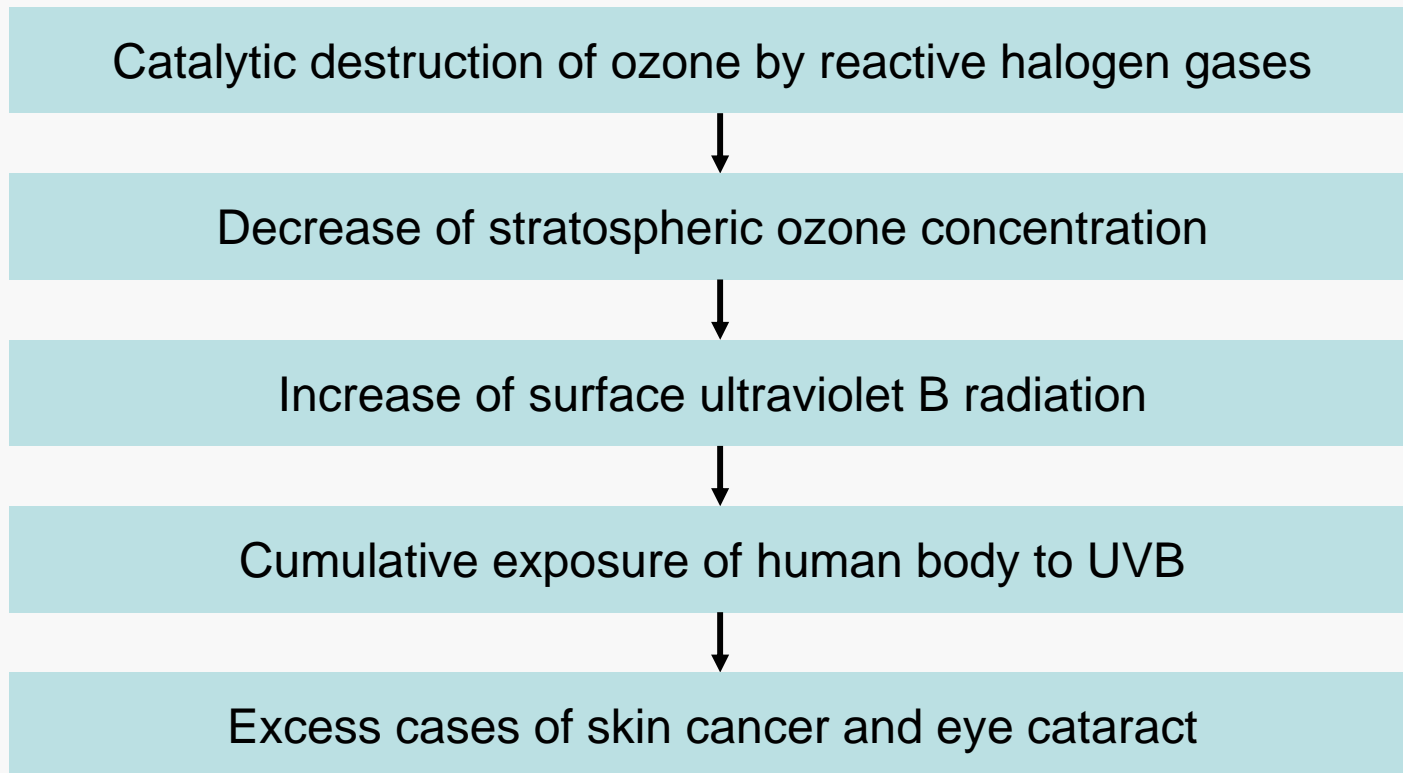
Temporal Sequence of Events in LCA

- Time of emission T_{em} if production at $t=0$? (Gabor Doka)
- Time of damaging effect T_{eff} if emission at time T_{em} ? (Ruedi Müller-Wenk)
- Present value of future damages? (Stefanie Hellweg)

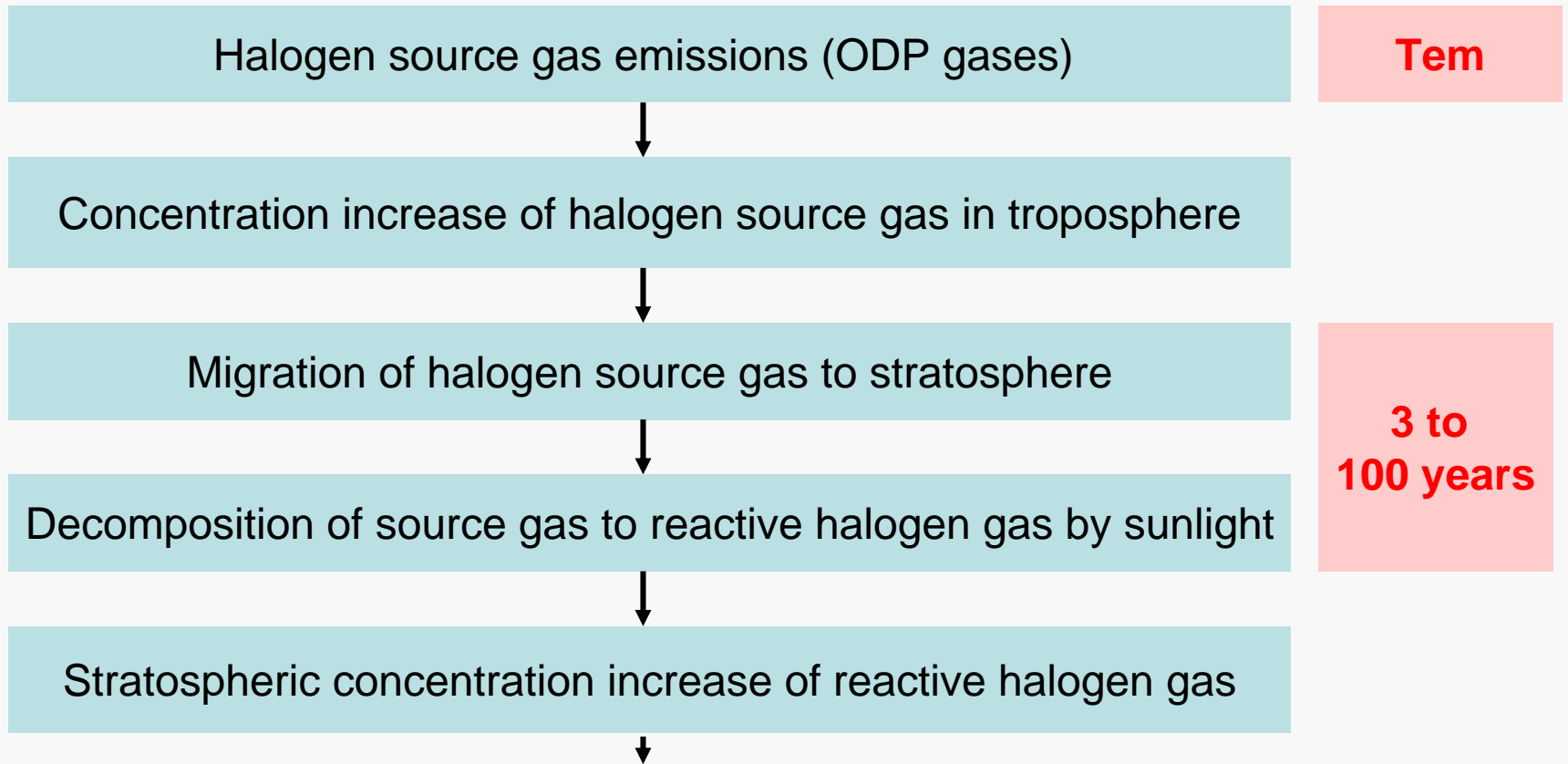
Cause Impact Pathway from ODP Emissions to Human Health



Cause Impact Pathway from ODP Emissions to Human Health (cont.)



The Time Aspect



The Time Aspect

Catalytic destruction of ozone by reactive halogen gases

months



Decrease of stratospheric ozone concentration



Increase of surface ultraviolet B radiation



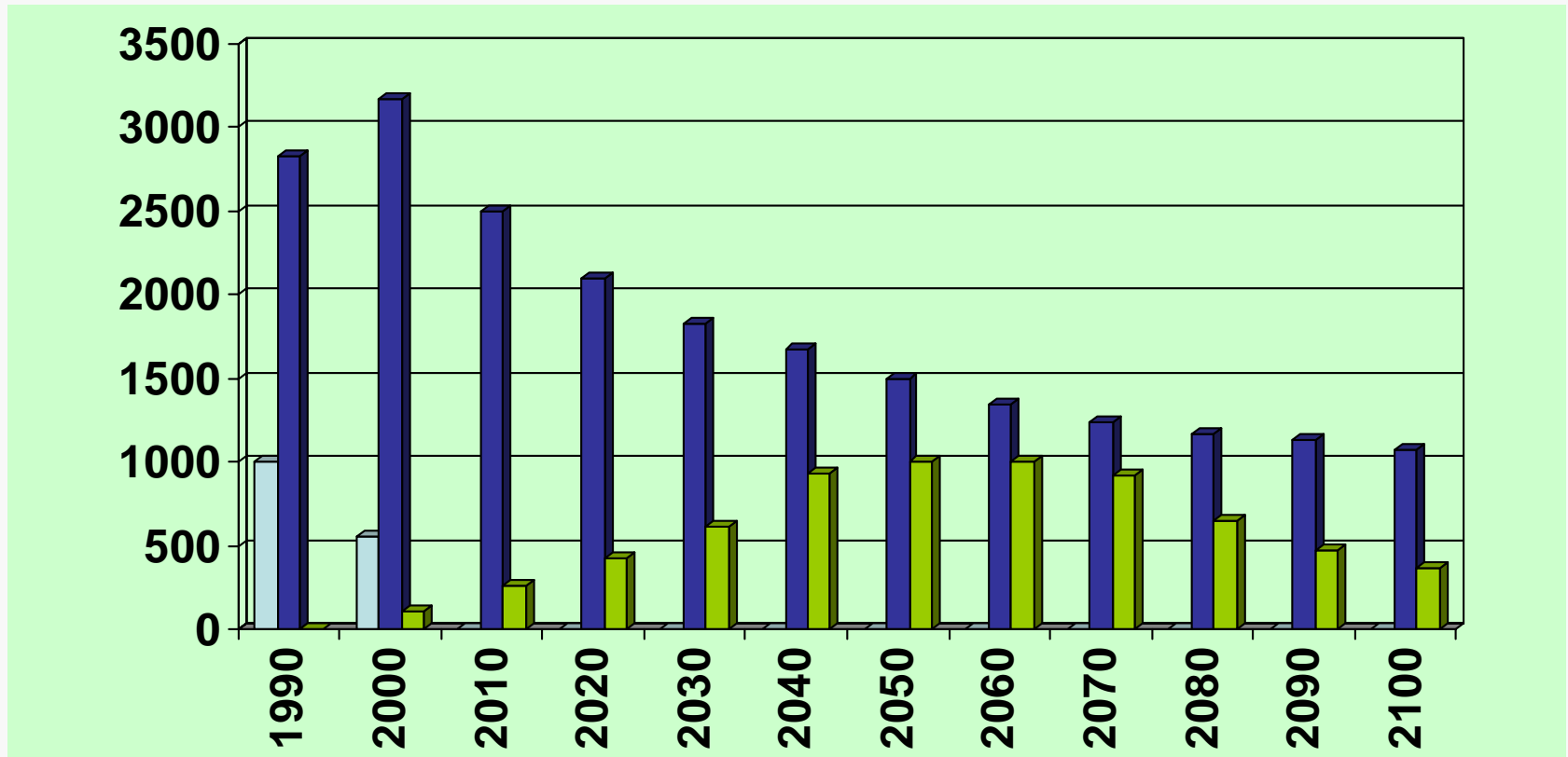
Cumulative exposure of human body to UVB



Excess cases of skin cancer and eye cataract

several
decades

ODP Emissions, Stratospheric Chlorine Concentration, and Excess Skin Cancer Cases per 10 mio. on Time Axis (Source: WMO)



Legend: ■ ODP emissions Mkg/y ■ Cl concentration pptv ■ excess cancer/10mio

Does it matter whether environmental processes run now or in future?

- **yes**, if we have reasons to assume that essential constraints will change, so that damaging effects will be larger or smaller
- **yes**, if we cannot take for granted that a given damage is valued irrespective of its time of occurrence

What can reasonably be expected to be different in year 2050?

- Human population will increase from 6'000 to 9'000 million [UN] >> Higher population density leads to more skin cancer cases
- Surface temperature in northern hemisphere 0.8 - 2.6°C higher than 1990 [IPCC] >> Change of sunbathing habits in northern latitudes causes more skin cancer cases

Whose forecasts are trustworthy?

- Forecasts for modelling environmental processes in future years **should not be selected arbitrarily**
- LCAs are inconsistent, **if one and the same forecast** is used in impact category A, but rejected in modelling of impact category B
- Judgements on forecasts: a task for **UNEP-SETAC**

Practical conclusions

- In LCA practice it is still acceptable despite disregard to the temporal dimension of environmental processes and damages
- **But:** Data on temporal dimension is now available. It is desirable to register them in LCI and to include them in LCIA modelling
- LCA works with assumptions on the future. We need a consensus on using forecasts.