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Assessing potential for reduction of near term forcing

Contribution to the
**UNEP Integrated Assessment of Black Carbon and
Tropospheric Ozone, and its Precursors**

Approach

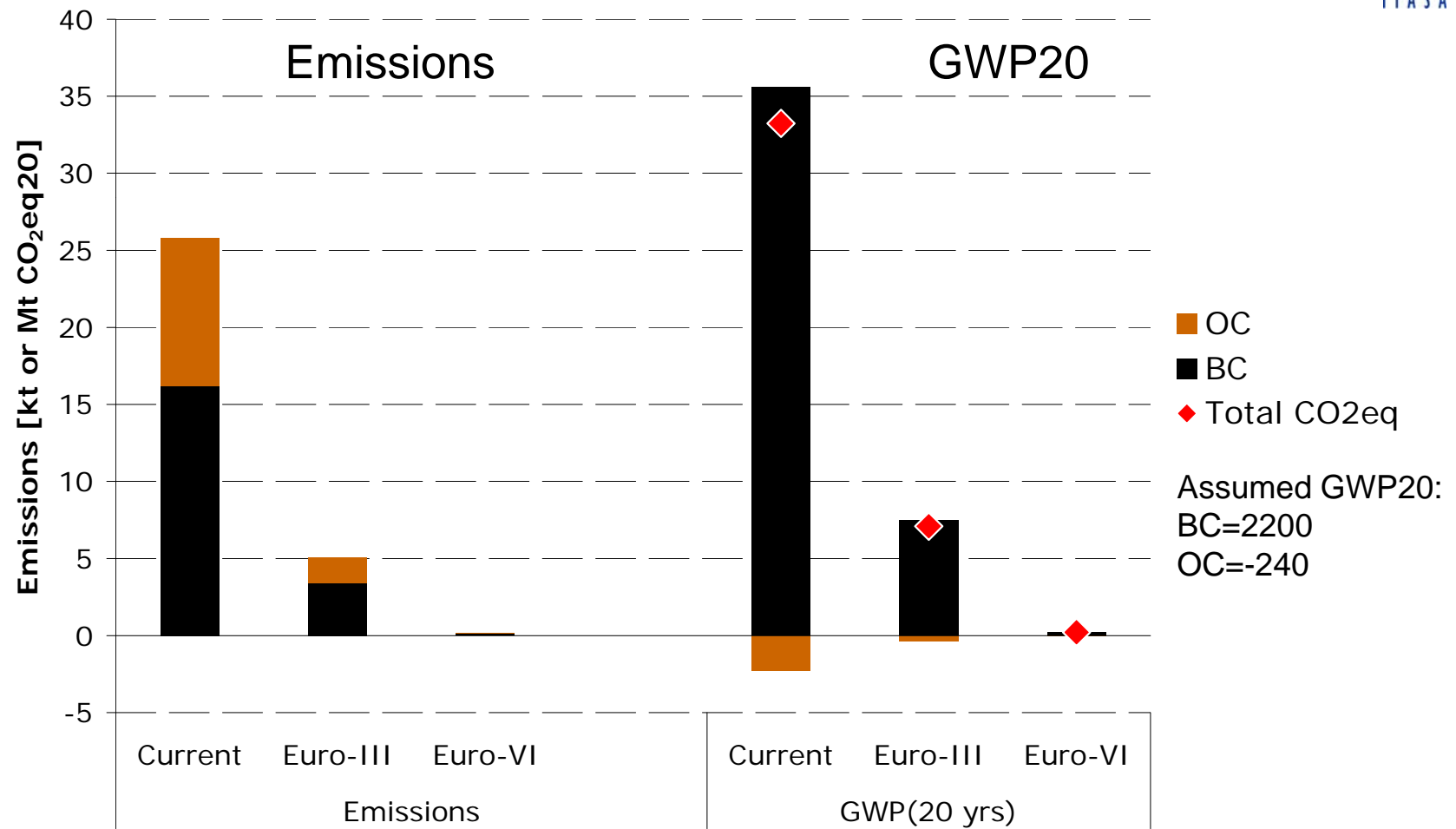
GAINS model – *From Baseline scenario towards RF mitigation*



1. Develop emission projections for all substances
(IEA 2009 World Energy Outlook Baseline and 450ppm, GAINS model technology db)
2. Determine future RF by sector and gas
(Literature GWP values)
3. Rank measures by net RF of their BC/OC reduction
(GAINS technology db, final version includes co-emitted species)
4. Choose a set of efficient measures and estimate their mitigation potential (including non-technical measures too, e.g., banning ag burning, eliminating high emitters)

Net GWP20 of BC mitigation

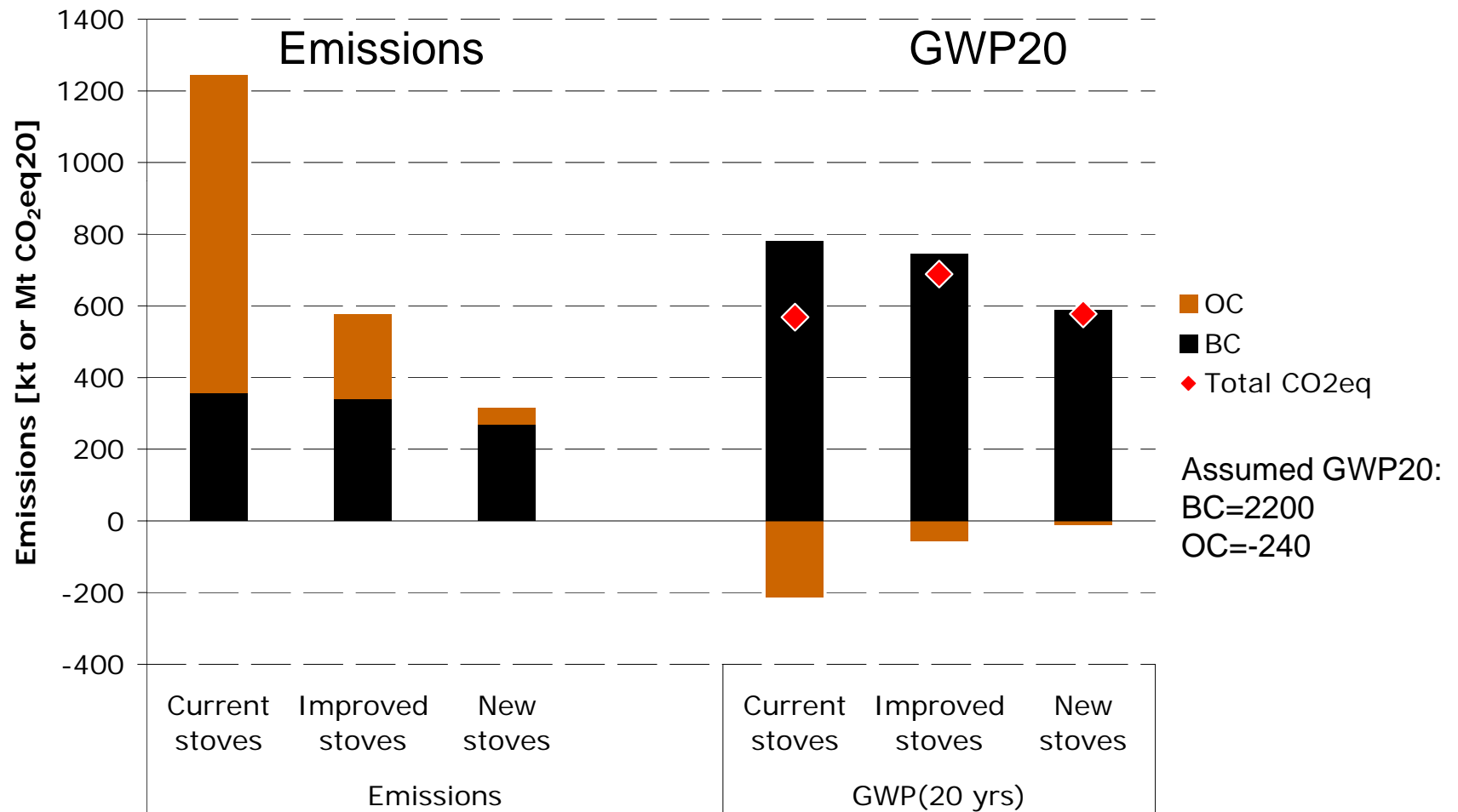
Diesel heavy duty vehicles (*Example for India 2030*)



Work in progress!

Net GWP20 of BC mitigation

Biomass (ag.residue, dung, wood) (*Example- cooking stoves in India 2030*)

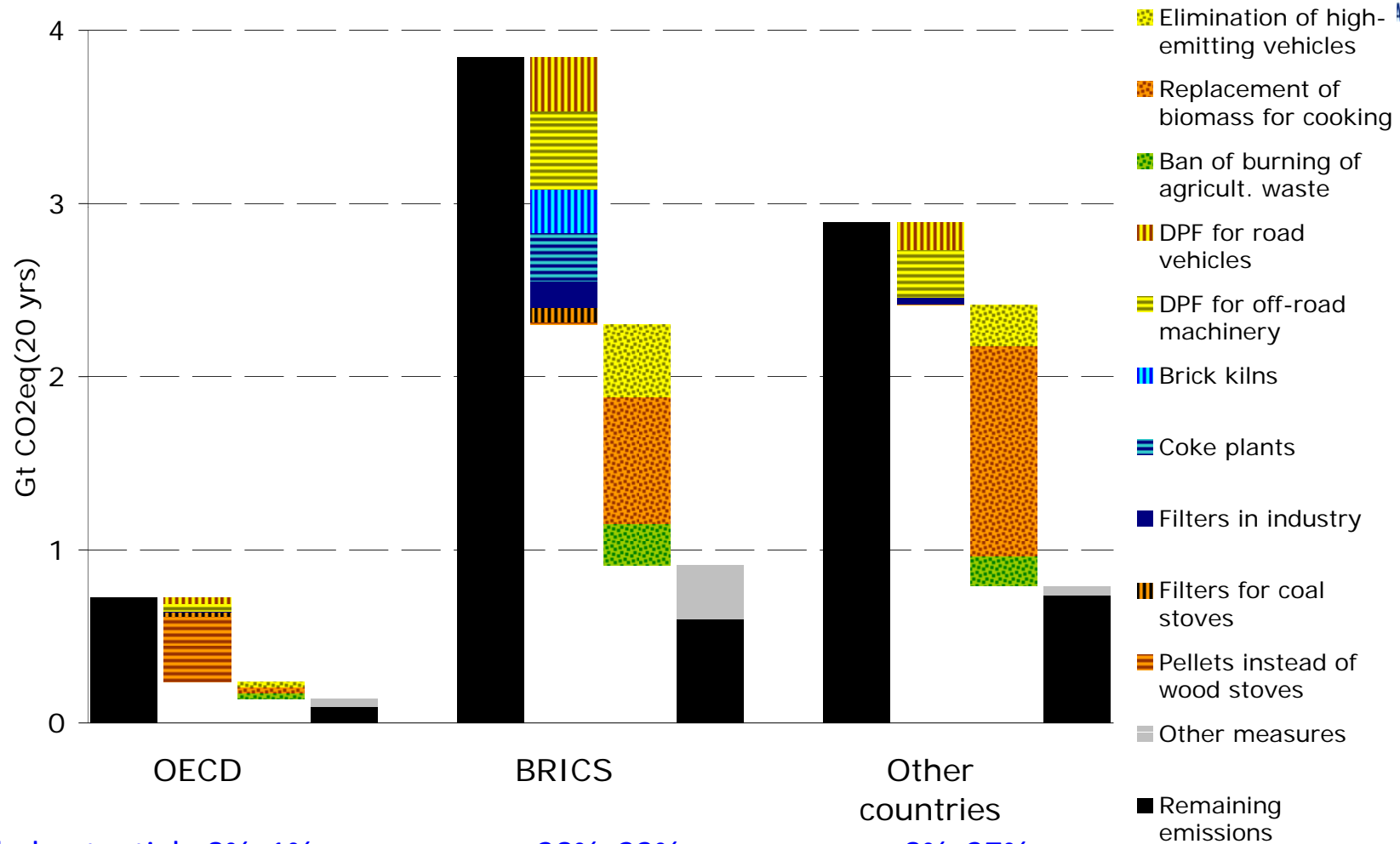


Work in progress!

Preliminary! Work in progress!

Mitigation potentials for BC+OC in 2030

Net impact on GWP20, IEA WEO2009 baseline



Of global potential: 8%+1%

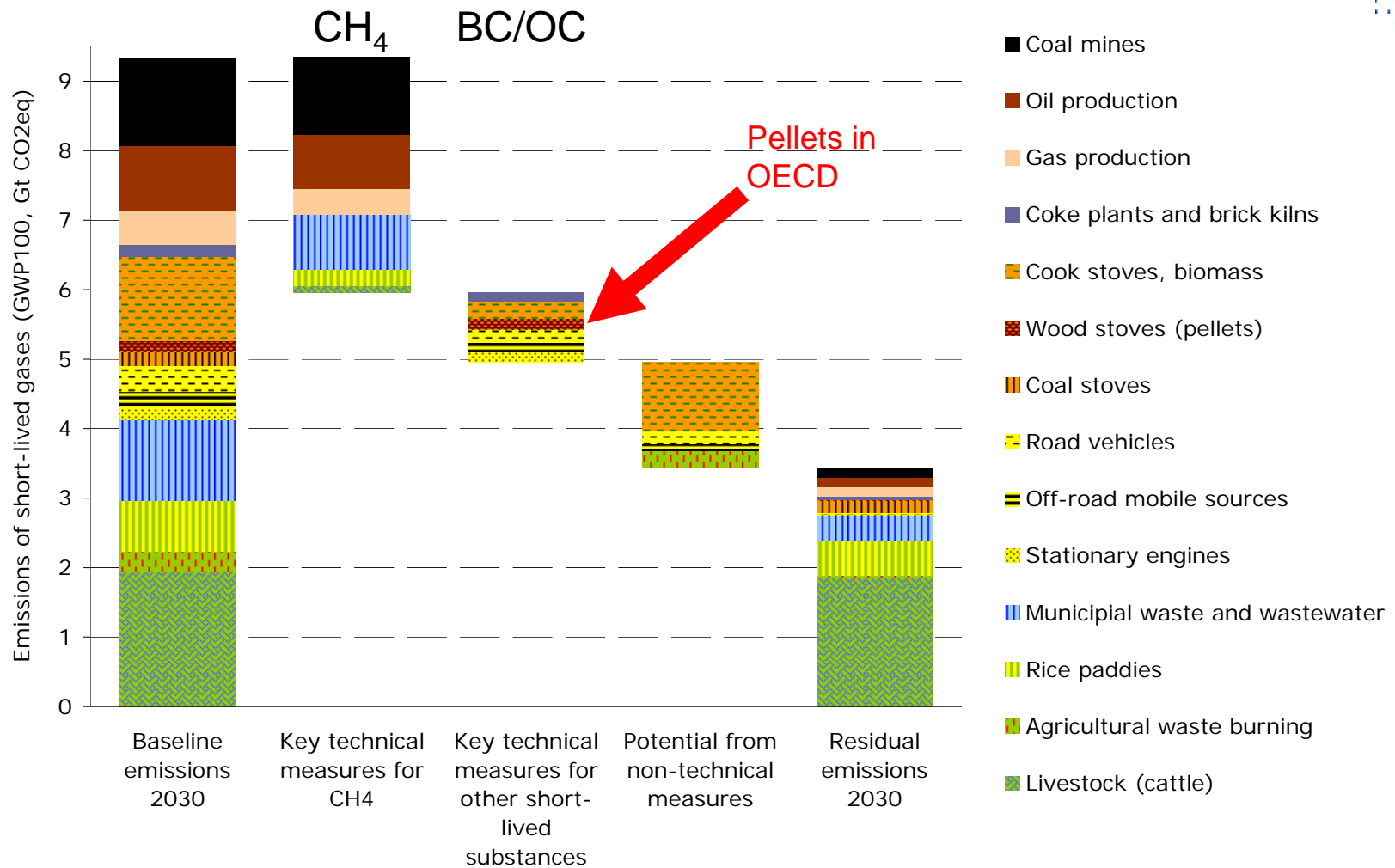
28%+23%

8%+27%

Preliminary! Work in progress!

Mitigation potential from short-lived forcers

Top 15 measures to reduce GWP100 globally, IEA REF 2030



Conclusions



- Globally, implementation of key measures could lead to a 75% reduction in short-term forcing of BC/OC in 2030.
- However, some of these improvements in RF will be compensated by associated reductions in co-emitted species' emissions.
- 50% of this potential emerges in BRICS countries, 33% in other developing countries.
- 45% of the mitigation potential could be achieved through technical measures, 55% require non-technical interventions.
- A health-targeted strategy would not necessarily reduce near-term forcing, but all BC measures also reduce health impacts (although not as efficiently).
- Keep realistic perspective for BC, and don't forget CH₄!
- SLFC reduction are not a substitution for CO₂ mitigation

extra material



Emission scenarios in GAINS (2)



- Control scenarios:

- **Low CH4**
(key measures)

Including:

- Extended recovery of coal mine gas
- Extended recovery and flaring (instead of venting) of associated gas from production of crude oil and natural gas

- **Low aerosol**
*(CH4 measures
RF impact)*

- Reduced gas leakage at compressor stations in long-distance gas transmission pipelines

- **Plus non**
*(Combinatio
cooking stove
of agricultural waste)*

Inclu

- Separation and treatment of biodegradable DF municipal waste through recycling, composting and Pe anaerobic digestion
- En Upgrading primary wastewater treatment to En secondary/tertiary treatment with gas recovery and Me overflow control

Further potential for BC mitigation



- Households:
 - Improved biomass and coal stoves, switch to pellets, etc.
 - Improving operating practices
- Industry and power generation:
 - Cyclones, ESP, fabric filters, etc.
 - Non-recovery coke ovens with end-of-pipe
 - Brick kilns: Tunnel kilns with end-of-pipe
- Road transport:
 - Particle traps (DPF) for heavy and light duty vehicles
 - Elimination of super-emitters
- Off-road:
 - Particle traps (DPF)
 - Elimination of super-emitters
- Open burning:
 - Ban of open burning of agricultural residues
 - Ban of open burning of garbage

UNEP BC Assessment - *background*



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- A global assessment focusing on black carbon, but includes ozone and its precursors
 - Provide credible overview of science and policies that can reduce emissions and impacts
 - The work is coordinated with other assessments, especially the 'Bounding BC' assessment
 - Beyond reviewing the literature it also undertakes modelling – with a focus on overall benefits of measures
 - A Report and summary for decision makers by February 2011

Emission scenarios in GAINS (1)



Historical data and Baseline (CLE):

- Key INPUT data
 - Energy data
(IEA, Eurostat, National statistics, bilateral consultations; projection World Energy Outlook 2009 (IEA))
 - Emission factors
(literature, bilateral consultations)
 - Combustion technology shares
(scarce published info, bilateral consultation and own assumptions)
 - Control technology shares
(published info, bilateral consultations, own assumptions)