

CDM for Public Administrations – PoA for buildings DRAWING ECOGERMA SP 2009

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■ Why a PoA for schools in Manaus?

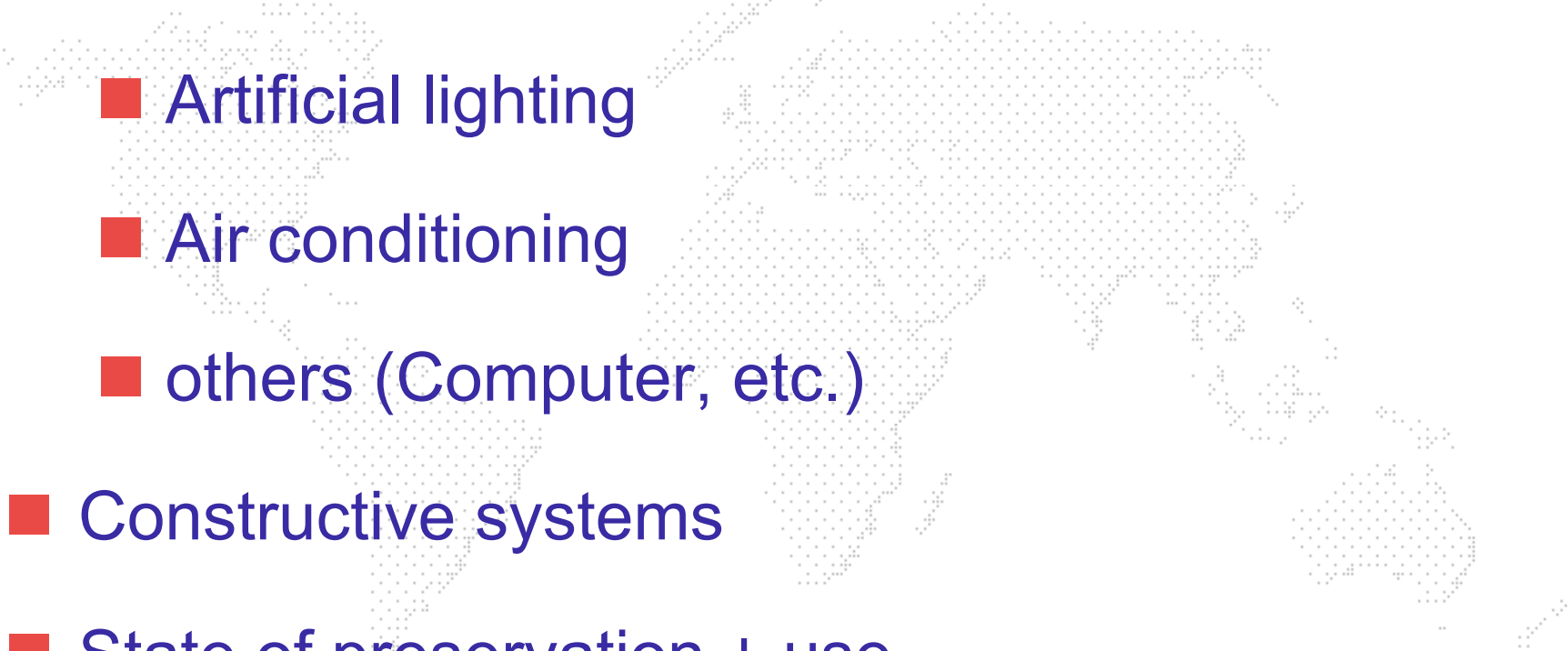
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- Energy and cost reduction for schools
 - Reduction of CO₂ emissions → Contribution for international climate protection
 - International Reputation (Novelty)
 - Improvement of learning conditions for pupils
 - Improvements of teaching conditions for teachers



- **Situation in Public Schools in
Manaus/Amazonas**

■ Energy Efficiency in Public Schools | PMM

- about 450 municipal schools (SEMED)
- Energy consumption in 2007: 15,5 million kWh
- Energy costs in 2007: R\$ 6.045.000,- (+ fines etc.)
- Data bank starting in 2006 (by InWEnt)

- 
- **Energy audit in 22 schools**
 - **Installed capacity**
 - **Artificial lighting**
 - **Air conditioning**
 - **others (Computer, etc.)**
 - **Constructive systems**
 - **State of preservation + use**
 - **Indoor Environmental Quality IEQ**



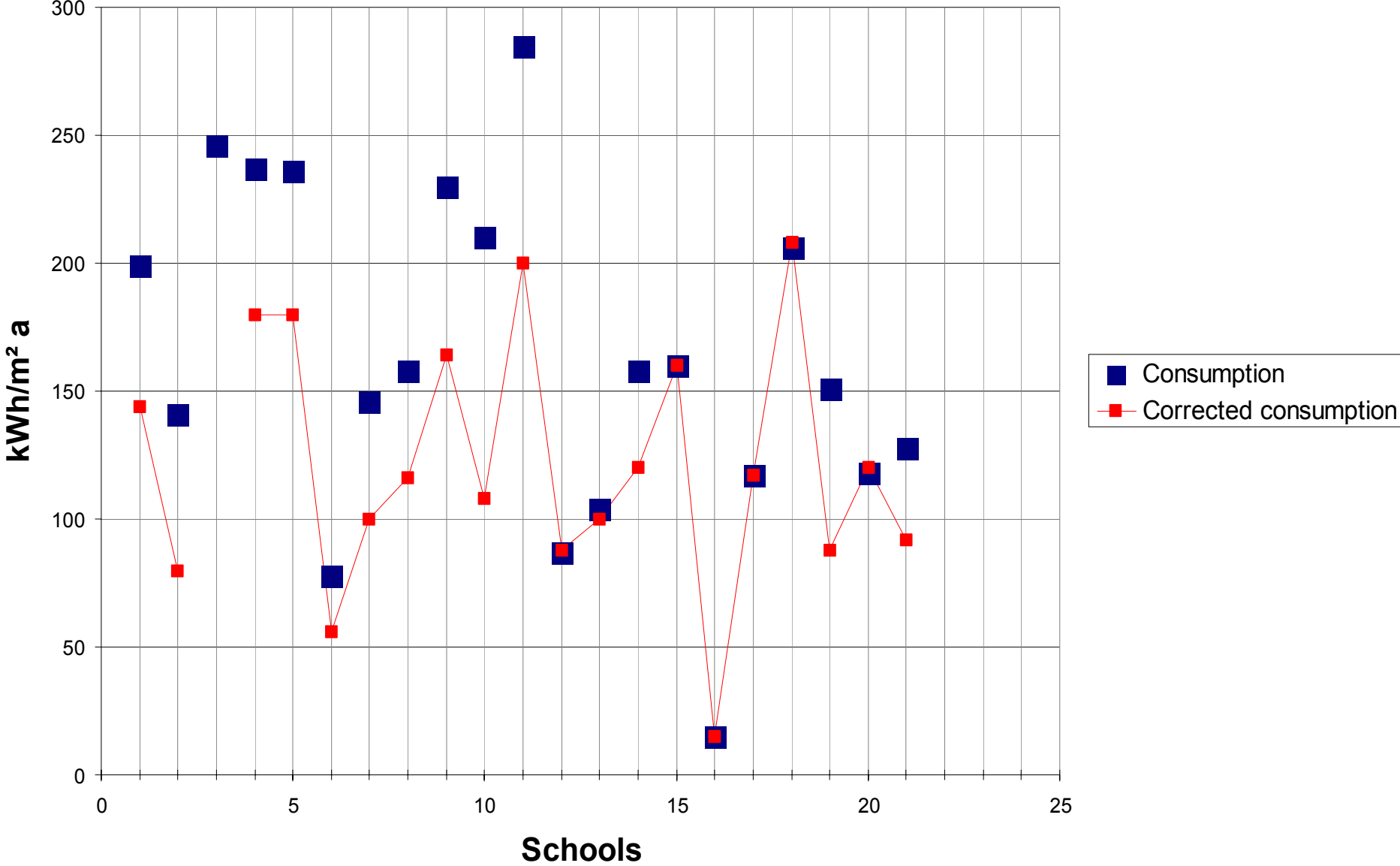
■ Results I

■ Energy consumption in kWh/m² a

- Effective surface 6 – 125 W/m²
- Effective surface with air conditioning: 15 – 285 W/m²
- Corrected consumption, introducing ENK* 15 – 208 W/m²

■ * ENK – Energienutzungsdichtekoeffizient (40 hours/week)

Energy consumption in 2006/2007 (average)



■ Results II

■ Installed capacity in W/m^2

- Air conditioning: 89 – 630 W/m^2
- Artificial lighting: 5,7 – 14,6 W/m^2
- Others

■ Results III

■ Indoor Environmental Quality:

- Artificial lighting below Brazilian Norm NBR
 - Daylighting extremely reduced
 - Acoustic problems
- Lack of maintenance

■ Retrofit EM Leonor Uchôa





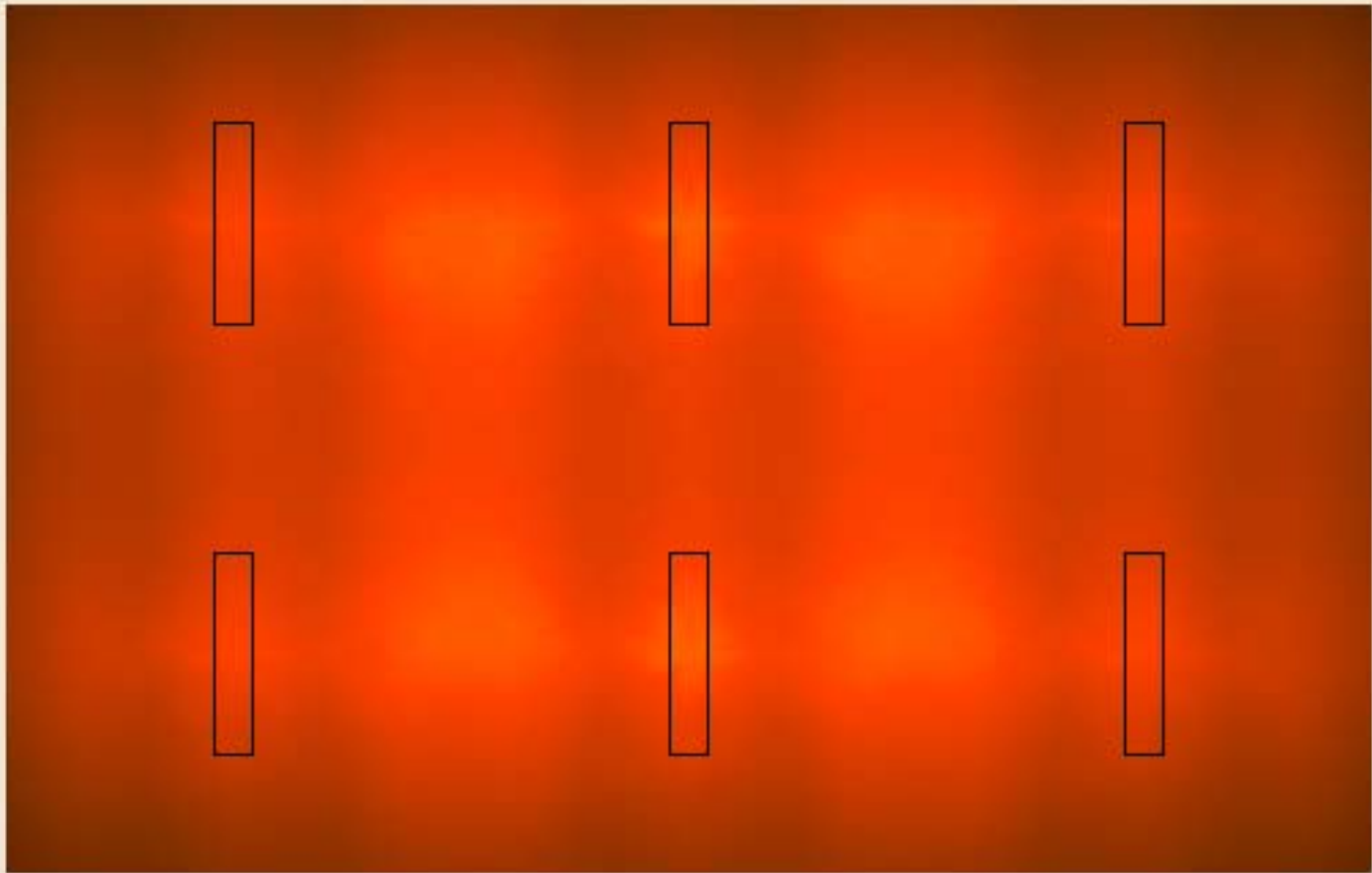
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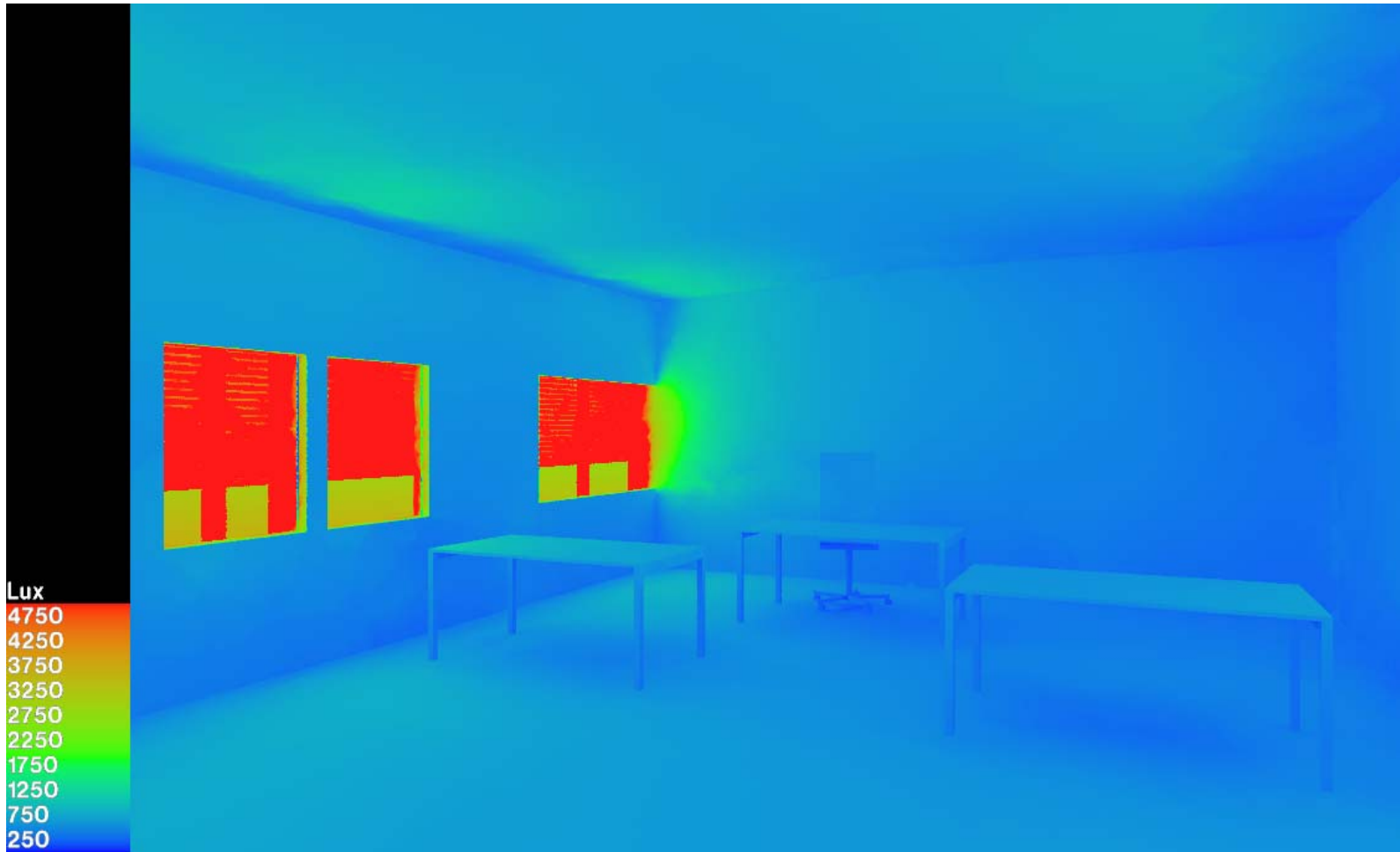
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■ Elevação do sol: 15°, Azimute 90° (Oeste)



■ Elevação do sol: 15°, Azimute 90° (Oeste)





■ Results (excerpt)

- New artificial lighting system is 50% more expensive, but
 - Payback time: 4 month
- Reduction of energy costs per year: R\$ 12.348,-.
- Total reduction:: R\$ 41,000.-/year (estimated)
- Implemented in 450 schools:
 - Economy of R\$ 2 – 3 million
- Improved teaching & learning environment

Selection of methodology: AMS-II.E

- „Energy efficiency and fuel switching measures for buildings”
- Simplified method
- Criteria for Application
 - „**Energy efficiency** [...] measure implemented at a single building, such as a commercial, institutional or residential building, or **group of similar buildings**, such as a **school**, district or university.“

Selection of methodology: AMS-II.E

- Application Criteria

- „Examples include **technical energy efficiency measures** (such as **efficient appliances, better insulation and optimal arrangement of equipment**) [..]. The technologies may replace **existing equipment or be installed in new facilities**. The aggregate energy savings [..] may not exceed [..] **60 GWh per year.**“

Selection of methodology: AMS-II.E

■ Application criteria

- „[...] applicable to project activities where it is possible to **directly measure and record the energy use** [...] (e.g. **electricity** and/or fossil fuel consumption)“.
- „[...] applicable to project activities where the **impact** of the measures implemented [...] can be **clearly distinguished from changes** [...] **due to other variables** [...]“.

■ Justification of Additionality

Two central possibilities of justification

1. Investment analysis
 - a. Measure economically not viable
 - b. Payback-time too long
2. **Barrier analysis, e.g.**
 - a. **First of its kind**
 - b. **Common practice**
 - c. **Lack of knowledge**
 - d. **Access to capital**
 - e. ...

■ Definition of Baseline

„The energy baseline consists of the energy use of the existing equipment that is replaced”

■ Estimation of Emission Reduction

■ Basic principle

Emission reduction =

– Emissions without PoA

– Emissions with PoA

■ Direct dependency to reduction in energy consumption

■ CO₂-reduction per kWh electricity: 910 g CO₂

■ Example from Energy Audit: EM Leonor Uchoa

	Value	Unit
Energy Consumption 2007	252.720	kWh
Economy Minimum	30%	
Economy Maximum	50%	
Economy Minimum	75.816	kWh
Economy Maximum	126.360	kWh
CO ₂ -reduction min.	69	t CO ₂
CO ₂ -reduction max.	115	t CO ₂

■ Monitoring method

- “In the case of retrofit measures, monitoring shall consist of:
 - Documenting the specifications of the equipment replaced;
 - Calculating the energy savings due to the measures installed.”

→ **Basic parameter is the evolution of the school's energy consumption**

■ Overall benefit of PoA in Manaus (estimation) per year – CO₂- revenues

	Value	Unit
Energy Consumption 2007	15.500.000	kWh
Economy Minimum	4.650.000	kWh
Economy Maximum	7.750.000	kWh
CO ₂ -reduction min.	4.232	t CO ₂
CO ₂ -reduction max.	7.053	t CO ₂
Revenues Min. (10EUR/t)	124.456	R\$
Revenues Max. 20EUR/t)	414.853	R\$

→ Utilization of the revenues for financing
Enforcement Agency

■ Résumé

■ Implementation of

- Coordinating Entity
- Enforcement Agency

■ After full implementation of program

- Active contribution for climate protection: Reduction of up to **7.000 t CO₂ per year**
 - Revenues of up to **0,4 m R\$ per year selling CER's** → Financing of Enforcement Agency
 - **Cost reduction for energy** up to **3.1 m R\$ per year** for further investments
- ## ■ Improvement of learning & teaching conditions in schools
- ## ■ PoA for buildings: make it as simple as possible!



■ Obrigado | Danke

