EMRAS II - DESCRIPTION OF THE MODEL DEVELOPED BY CPHR (Cuba)

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Introduction

- Developed by CPHR in support of emergency preparedness program in the country and in the frame of EMRAS;
- Uses information (parameter values, approaches) available from best practices, some parameters chosen by judgement;
- Based on ECOLEGO® code developed by Facilia AB (Sweden).

General Features

- A compartment model;
- Uses a conservative and averaging approach;
- Considers the contribution of each compartment into a location “cluster” configured in the point of interest, on a percentage basis.

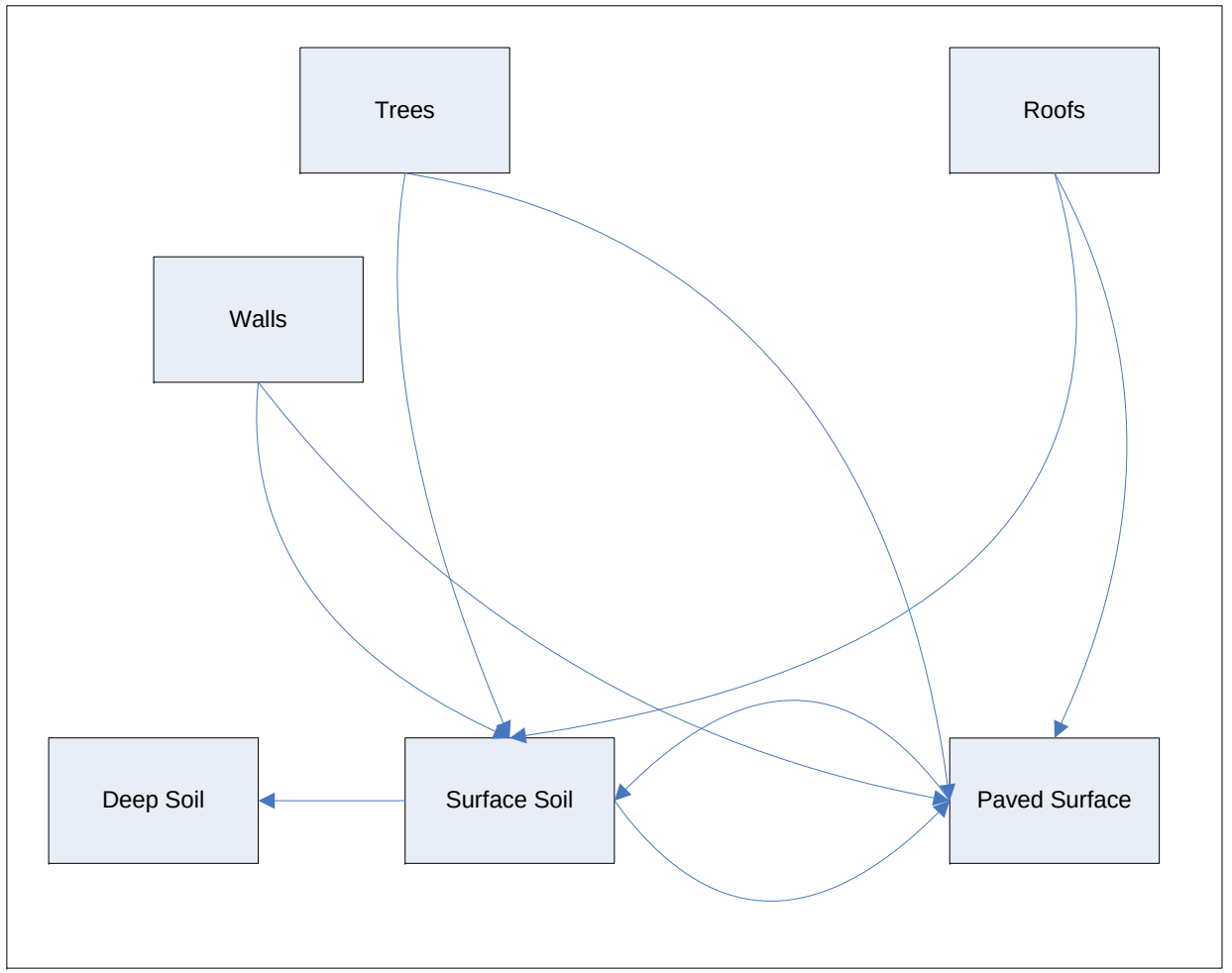
Considered compartments – EMRAS I

- **Paved Surface** - for artificially covered surfaces;
- **Surface Soil** - for all open not covered artificially areas;
- **Roofs** - for all the buildings covers;
- **Trees** - for areas covered by trees;
- **Walls** - for all vertical surfaces in buildings;
- **Deep Soil** - for considering the migration from the top layers of soil to the deeper ones.

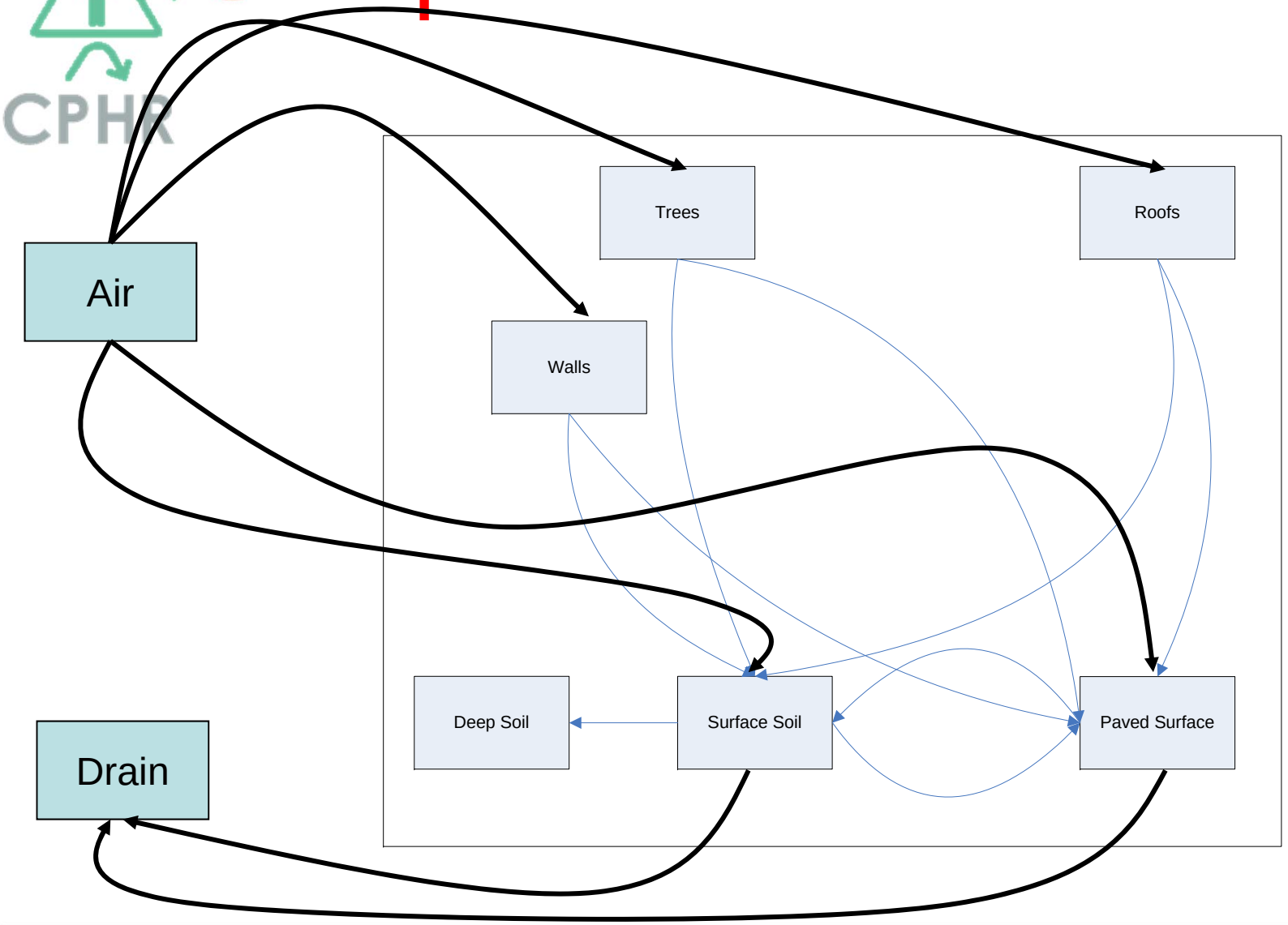
Considered compartments – EMRAS II

- **Air** – initially contaminated compartment;
- **Paved Surface** – for artificially covered surfaces;
- **Surface Soil** – for all open not covered artificially areas;
- **Roofs** - for all the buildings covers;
- **Trees** - for areas covered by trees;
- **Walls** - for all vertical surfaces in buildings;
- **Deep Soil** - for considering the migration from the top layers of soil to the deeper ones;
- **Drain** – for considering the sewerage systems.

Compartments – EMRAS I



Compartments – EMRAS II



Mathematical approaches

$$\frac{dA_i}{dt} = (A_i)_0 - \sum_{j \neq i} \lambda_{i \to j} \times A_i + \sum_{j \neq i} \lambda_{j \to i} \times A_j$$

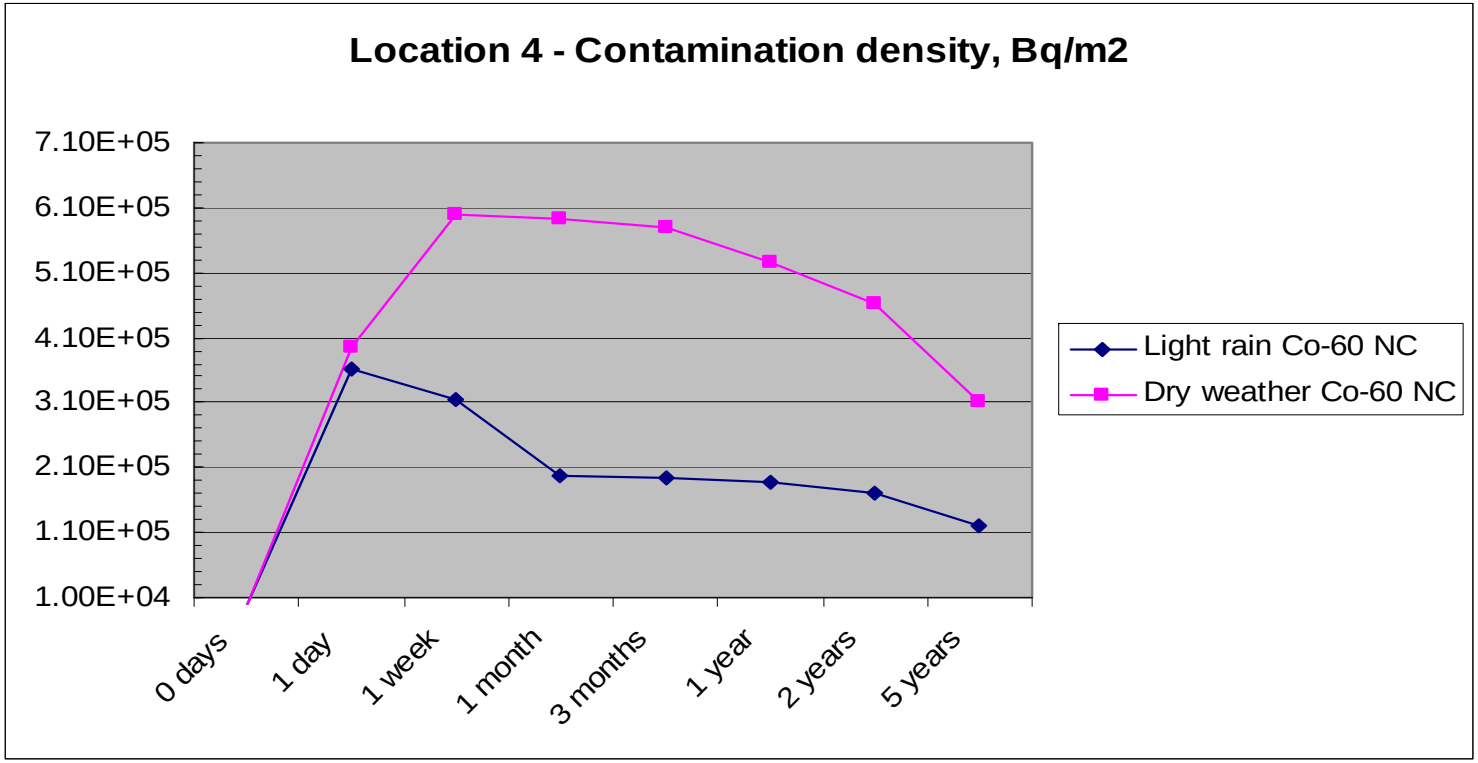
Key assumptions

- Transport process resuspension was neglected;
- Transport of contaminants out of the considered system only through “Drain” compartment;
- Consideration of both external and internal dose rates;
- Light and heavy rain considered in the first days of the modelled period.

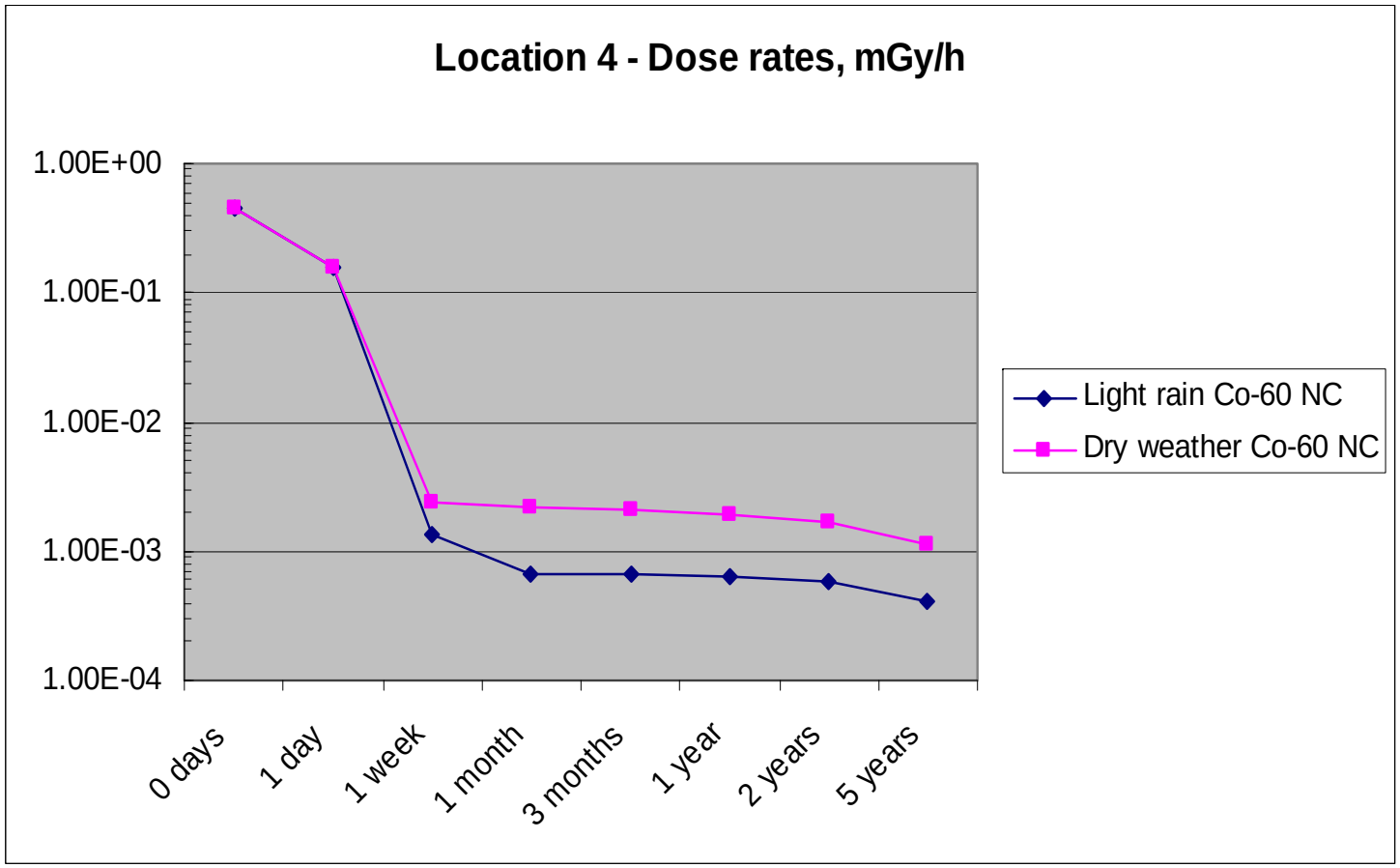
Some parameters

Coefficient	Values
Dry deposition velocity	400 m/d for Co, 800 m/d for Pu
Washout coefficient	0.001 mm-m/day^2
Half lives	Roofs – 170 d for Co, 480 d for Pu
	Walls – 180 d
	Trees – 180 d
	Paved – 30 d
	Soil – 30 d
Filtration factor	0.7

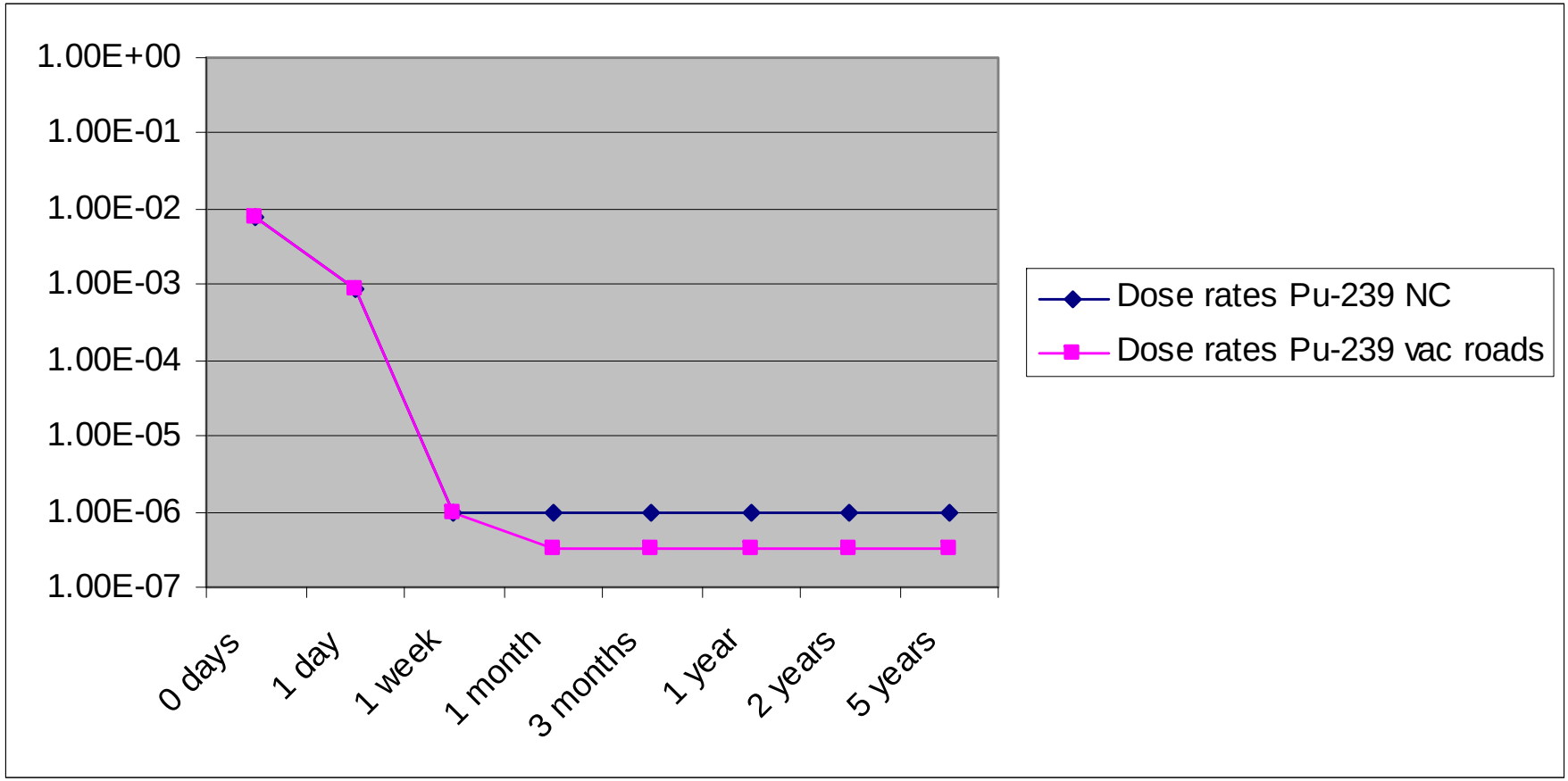
Some results – rain effects



Some results – rain effects



Some results -CM



Thank you