MATHEMATICAL MODEL DEVELOPMENT FOR REAL ESTATE VALUATION

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SUMMARY

Data

Methodology

Results as is

To be

AVAILABLE DATA

Deeds

- Type of deed
- Price of transaction
- Cadastral parcel
- Property rights

Cadastral documentation

- Type of property
- Usable surface
- Built surface
- Construction year
- Modification year
- Comfort

Other

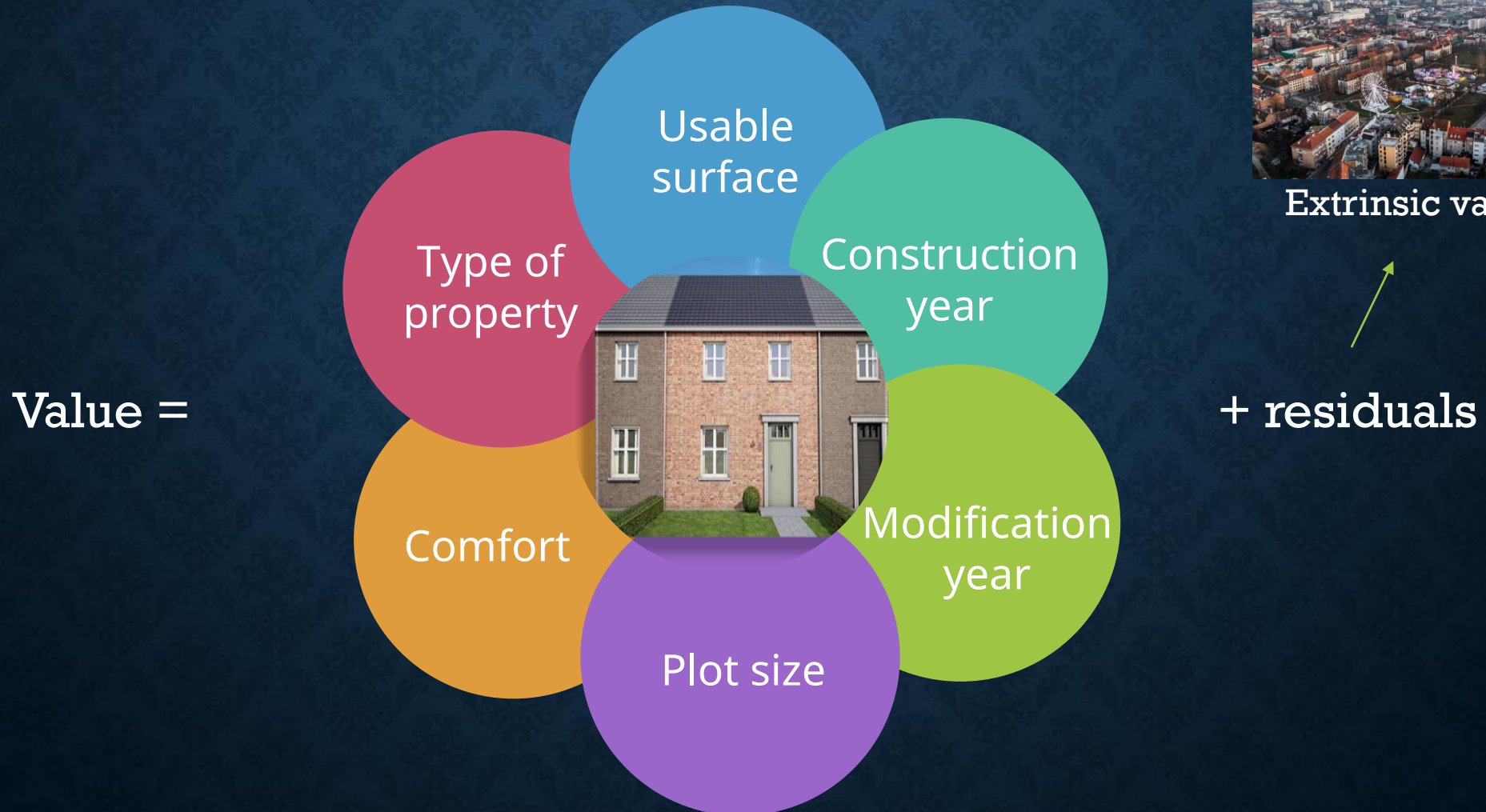- Statistical sectors
- Agregated sectors

METHODOLOGY

Idea ?

1. An identical building has the same construction cost wherever the location (intrinsic value, cost of the brick)

2. What makes the rest of the value is the extrinsic value
   - ➤ Working in 2 phases

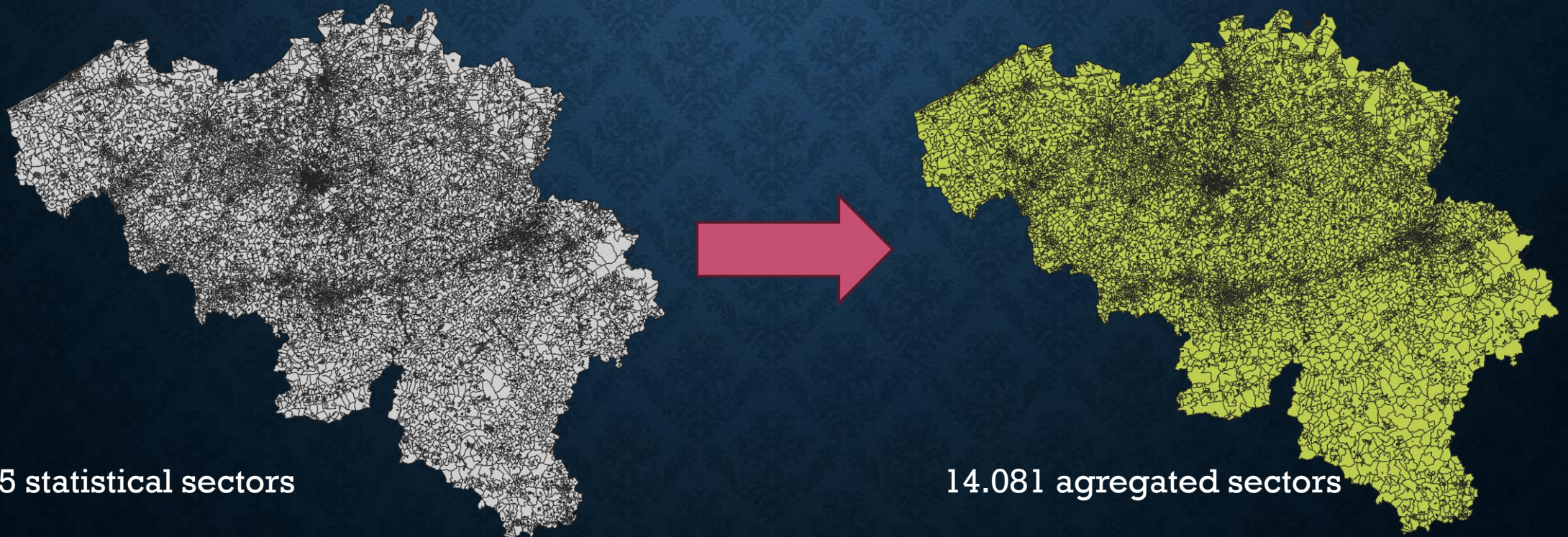Filters → Intrinsic value → Zones of value → Extrinsic value → Property value
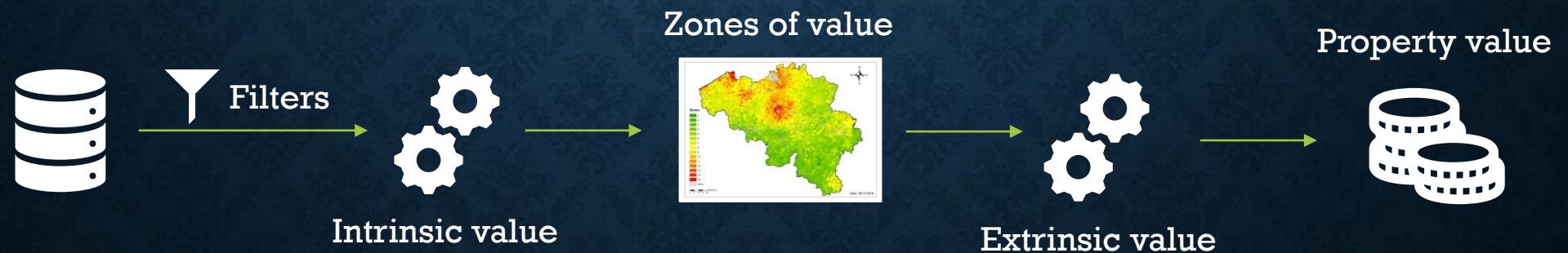
METHODOLOGY INTRINSIC VALUE

- Hedonic models only based on property characteristics

Extrinsic value

Value =

+ residuals

METHODOLOGY EXTRINSIC VALUE

The objective is to determine the impact of the neighbourhood and to maximise the number of samples in each zone

  ➢ Multiples neighbourhoods (statistical sector) can form a single zone of value
  ➢ Manual work done by the experts when insufficient data in a given sector (aggregation)
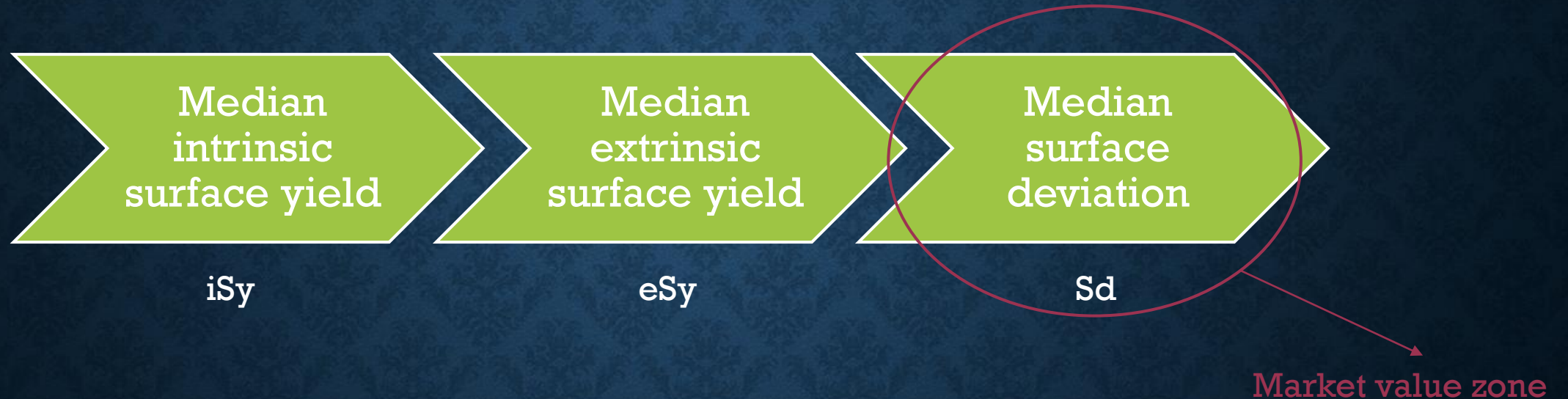

19.795 statistical sectors   14.081 agregated sectors

METHODOLOGY EXTRINSIC VALUE

Working with a surface yield to determine the zones of value

Median intrinsic surface yield	Median extrinsic surface yield	Median surface deviation
iSy	eSy	Sd

Market value zone

Property value = intrinsic value + extrinsic value
$$= iSy * US + eSy*US + \xi$$

MARKET VALUE ZONES

- 15 differents market value zones by aggregated statistical sector

- Each zone represents a band of 10% deviation around the median

Example :
Zone 7 = deviation between -5% en 5%

Zones

⬜	1	🟧	9
⬜	2	🟧	10
🟨	3	🟧	11
🟨	4	🟥	12
🟨	5	🟥	13
🟨	6	🟥	14
🟧	7	🟥	15
🟧	8	⬜	No data
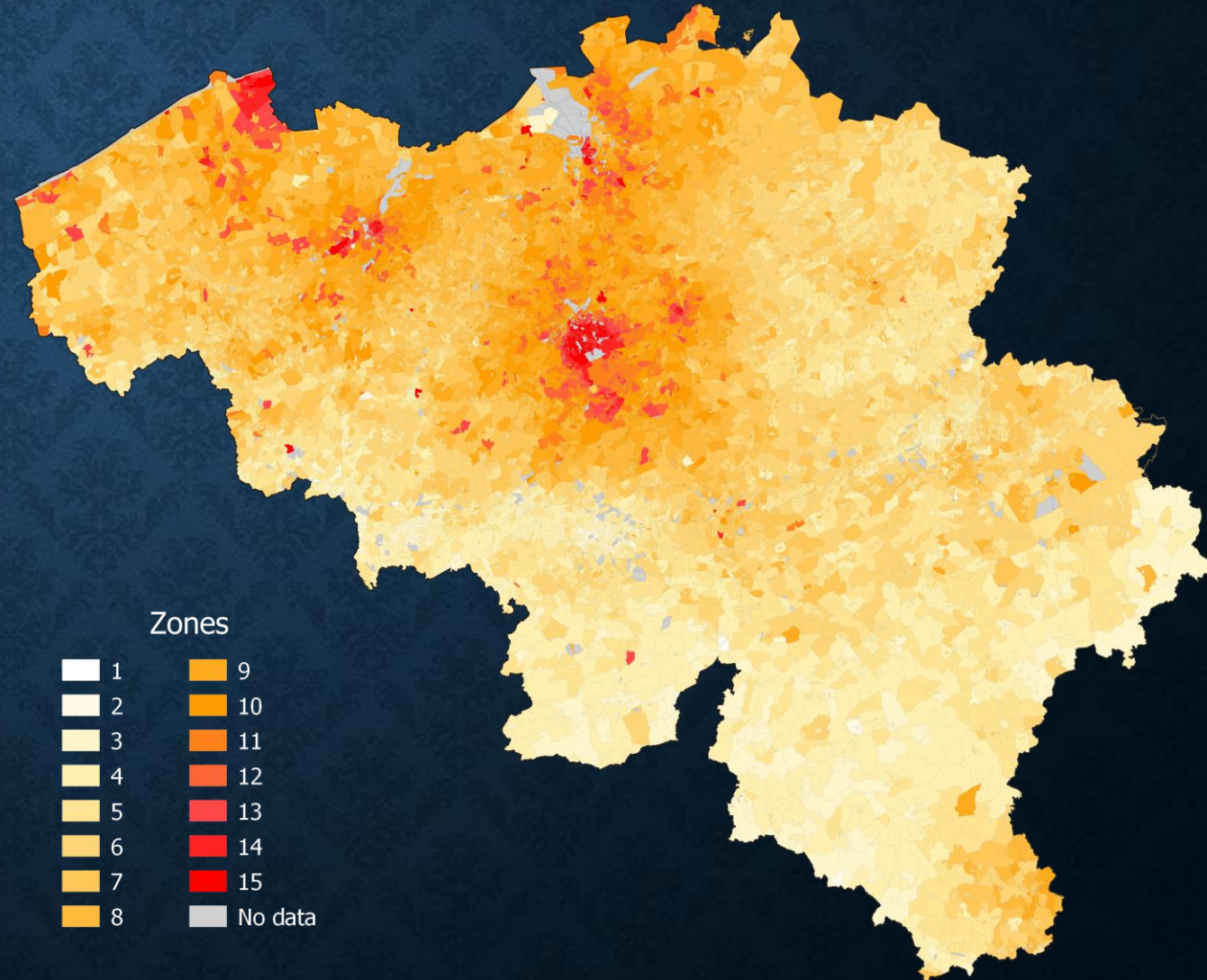
RESULTS AS IS

Working model for houses
Mean error = 18%

Working model for apartments
Mean error = 15%

Proportion of the variation explained by the variables = 85%

More complicated for commercial buildings (working with raster zones)

TO BE

- Improve the performance of the existing models

  - Add new data like energy performance (regional data)

- Elaborate models for other types of properties (grounds, parking spaces,…)

- Implementation for risk management

TO GO FURTHER

- Use those models to compute a new tax base (actual value already used for foreign properties owned by Belgians)
  - ➤ To restore tax fairness among taxpayers

Cadastral incomes evolution if using the actual value

Legend
Houses Evolution
- <= 0%
- 0% - 20%
- 20% - 30%
- 30% - 40%
- 40% - 50%
- 50% - 70%
- 70% - 90%
- >90%

0 5 10   20   30   40
Kilometers