



How to calculate the indicators for the residential sector

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Q1 – Question

Q1. For each end use, choose the most relevant activity data from the list among those available to calculate energy intensities.

	Activity data chosen
Total sectoral consumption	
Space heating	
Space cooling	
Water heating	
Cooking	
Lighting	
Total appliances	

- Population (million)
- Total number of dwellings (million)
- Occupied dwellings (million)
- Residential floor area (occupied, million sqm)

Q1. For each end use, choose the most relevant activity data from the list among those available to calculate energy intensities.

	Activity data chosen
Total sectoral consumption	Occupied dwellings (million)
Space heating	Residential floor area (occupied, million m ²)
Space cooling	Residential floor area (occupied, million m ²)
Water heating	Occupied dwellings (million)
Cooking	Occupied dwellings (million)
Lighting	Occupied dwellings (million)
Total appliances	Occupied dwellings (million)

- Population (million)
- Total number of dwellings (million)
- Occupied dwellings (million)
- Residential floor area (occupied, million sqm)

Q2. Between 'occupied dwellings' and 'total dwellings', what would be more appropriate as activity data to develop indicators? Please discuss the reason.

(Hint: Total dwellings = permanently occupied dwellings + vacant or seasonal dwellings)

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(Hint: Total dwellings = permanently occupied dwellings + vacant or seasonal dwellings)

Answer: Occupied; because if we include vacant residences, energy intensities may be lower than actually is.



Primary residences



Unoccupied dwellings



Vacation homes

Q3 – Question

Q3. Based on the data provided, give three possible reasons why total residential energy consumption increased over time.

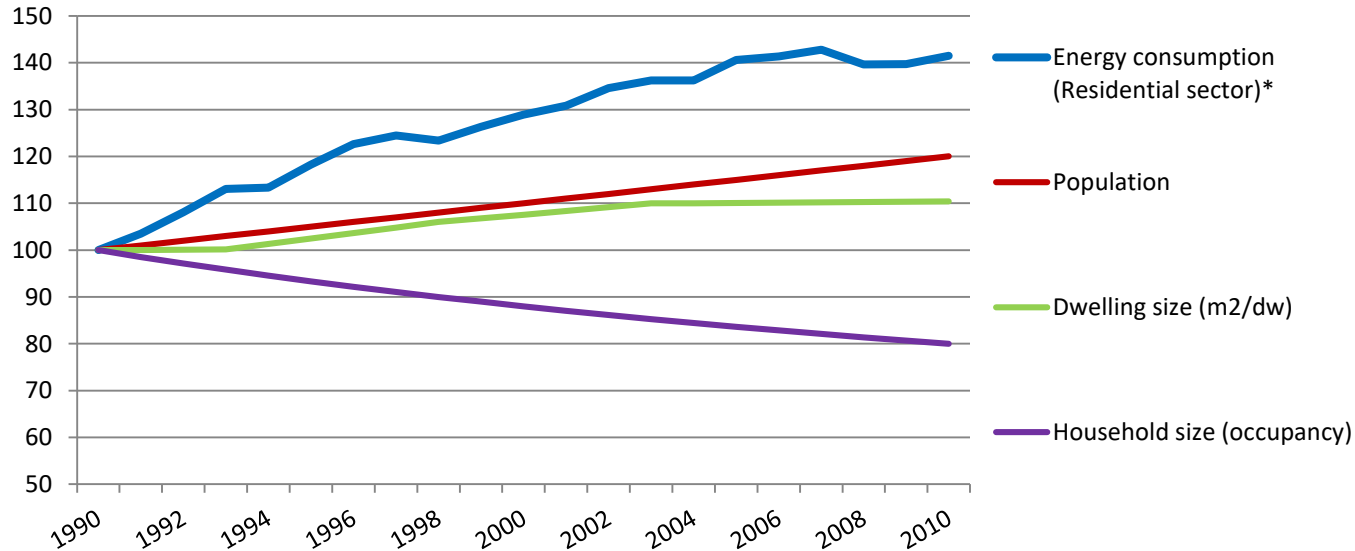
Energy consumption data (PJ)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aggregated sectoral consumption	1455	1496	1579	1667	1689	1826	1816	1804	1815	1894	1968	1917	2038	1954	2035	2152	2047	2105	2021	2017	2228
Space heating	553	561	597	647	657	734	690	645	691	749	771	707	801	710	767	849	725	771	726	733	905
Space cooling	25	20	23	14	41	34	28	30	36	39	41	37	39	29	45	42	37	44	36	29	51
Water heating	370	380	410	441	400	435	451	467	402	403	434	445	449	461	456	477	486	479	447	441	454
Cooking	96	95	97	98	104	107	104	107	112	115	119	114	117	121	123	123	125	126	127	127	129
Lighting	77	78	80	81	83	85	86	88	90	90	90	91	91	92	92	93	94	94	92	86	79
Appliance	335	361	373	385	404	432	457	467	484	498	513	523	541	542	552	569	580	591	593	600	610

Activity data	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Population (million)	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
Total number of dwellings (million)	38	39	40	41	42	43	44	45	46	47	47	48	49	50	51	52	53	54	55	56	57
Occupied dwellings (million)	35	36	37	37	38	39	40	41	42	43	44	44	45	46	47	48	49	50	51	51	52
Residential floor area (occupied, million sqm)	2757	2827	2898	2969	3072	3178	3285	3395	3508	3606	3707	3809	3913	4018	4095	4172	4250	4328	4407	4487	4567
Average occupancy of dwellings	2.8	2.8	2.8	2.7	2.7	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3
Average floor area of dwellings	79.1	79.2	79.2	79.3	80.2	81.1	82.0	82.9	83.9	84.5	85.1	85.7	86.4	87.0	87.1	87.1	87.1	87.2	87.2	87.3	87.4

Supplementary information for temp. correction	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Heating degree days	3633	3596	3724	3873	3825	4254	3852	3620	3751	3928	4099	3705	4028	3546	3869	4140	3602	3756	3590	3596	4393
Cooling degree days	455	372	318	191	524	398	326	358	409	438	475	419	431	302	491	449	376	437	399	329	560

Q3. Based on the data provided, give three possible reasons why total residential energy consumption increased over time.

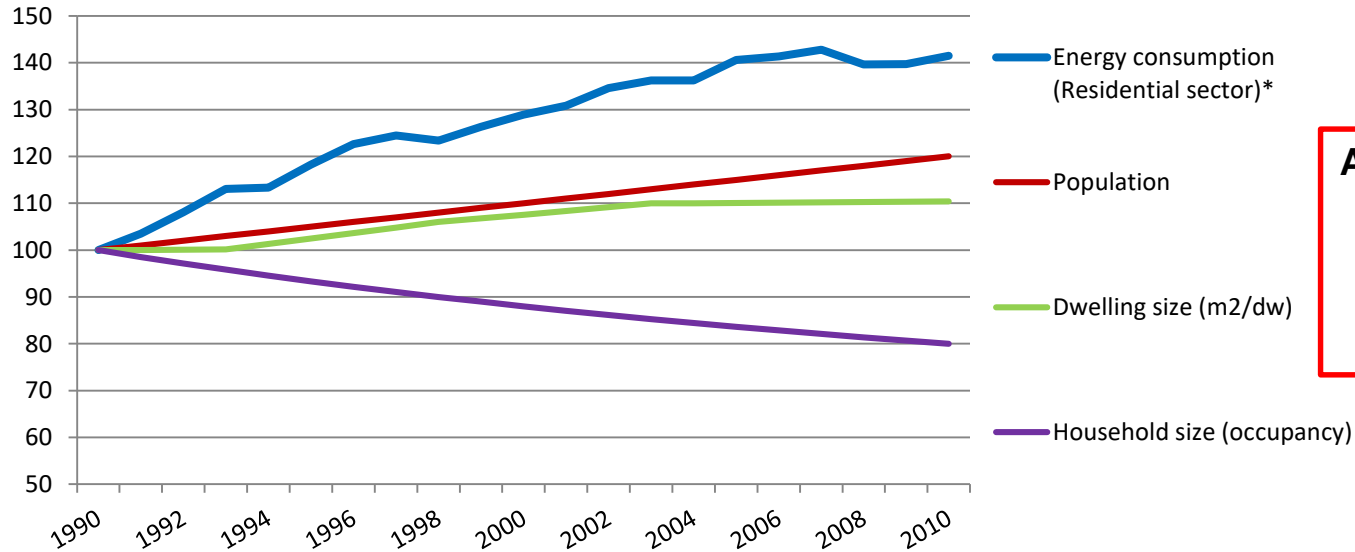
Residential sector – selected activity data, 1990 Index



* Temperature corrected

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Residential sector – selected activity data, 1990 Index



Answer:

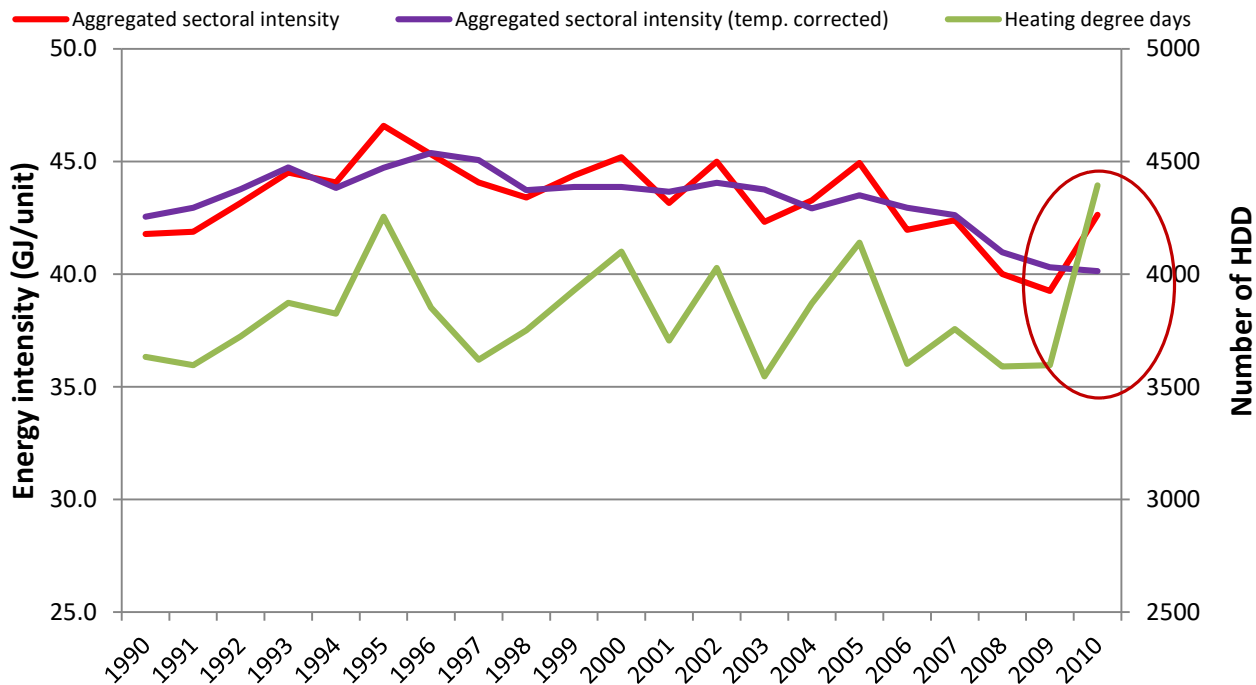
1. Population growth
2. Smaller families
3. Larger dwellings

Q4 – Question

Q4. Total residential energy consumption per dwelling increased significantly between 2009 and 2010. The country's energy minister became concerned about this change. As an energy efficiency expert, how would you advise her/him?

Energy intensity (GJ/unit)	2009	2010
Aggregated sectoral intensity	39.3	42.6
Heating degree days	3596	4393

Q4. Total residential energy consumption per dwelling increased significantly between 2009 and 2010. The country's energy minister became concerned about this change. As an energy efficiency expert, how would you advise her/him?



Answer: The increase of per-dwelling energy consumption was mainly due to a colder winter.

Q5. Make a temperature correction for space heating and space cooling, using the following formula. What differences do you see in energy intensity trends after the adjustment ?

$$\text{Total energy consumption for space heating}_t * \frac{\text{average heating degree-days}_{tbase_t}}{\text{heating degree-days}_t}$$

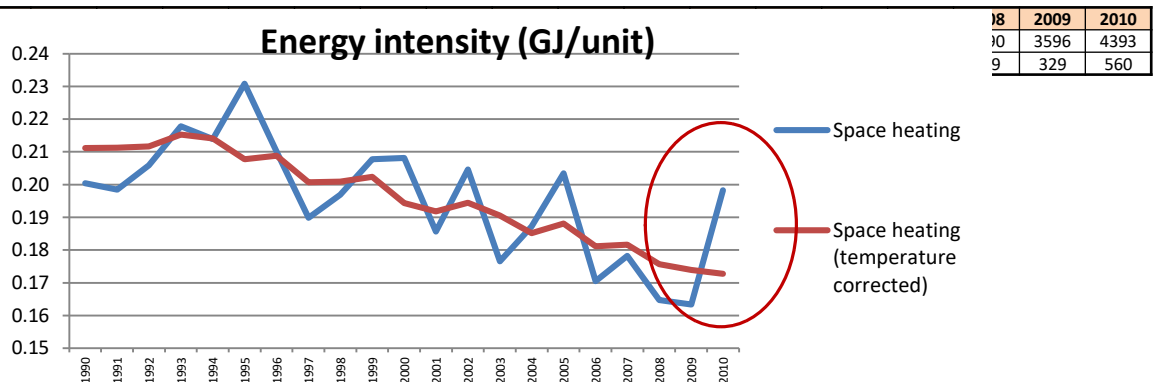
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Aggregated sectoral consumption (temp. corrected)	1482	1534	1601	1676	1680	1753	1818	1845	1828	1872	1910	1939	1995	2020	2019	2084	2095	2116	2069	2071	2097
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Cooling degree days	455	372	318	318	318	318	318	318	318	318	318	318	318	318	318	318	318	318	318	318	318



Answer: Energy intensity trends are more stable. (e.g. between 2009 & 2010)

iea



Energy Working Group

EGEDA
under EWG-APEC