

Theories, categories and units: collecting and using data on time, mobility and energy demand.

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A very simple proposition

The energy used in buildings and for mobility is an outcome of what people do: the practices in which they are engaged, and how they spend their time.

Changes and variations in energy demand relate to changes and variations in practice.

A curiously tricky challenge

Using existing data on mobility, energy and time use to capture this relation



TIME USE

ENERGY

MOBILITY

These fields have different traditions and priorities and work with different units/forms of data collection.

There is a politics of knowledge throughout:

- Who wants to know what?
- Funders and users
- Underlying goals and ambitions

We briefly review histories of data collection in these three areas:

- What is asked?
- What is not asked?
- What might be asked – in relation to new goals and ambitions?

TIME USE

Over time

1962	BBC audience research 120 coded activity categories; half hourly intervals, focus on radio and TV. Skips night time.
1974-75	BBC <i>“The People’s Activities and Use of Time”</i> 40 coded activity categories; half hourly intervals, August 1974 to March 1975 to support seasonal analysis. Skips night time.
1984-85	ESRC time diary study; 180 coded activities; 15 min intervals, over 24 hours. More on co-presence and location.
1987	ESRC; New categories: telephoning, computing and related activities (virtual mobility)
1995	ONS: 30 codes (light weight version)
2000-01	ONS: extensive, ten minute time slots, multiple cross-cutting codes; study supported by a wide range of government departments.
2005	Follow up to 2000-01.

TIME USE

Key features

- The individual diarist
- Time slots (vary): 30, 15 and 10 minute intervals
- Number of codes and categories (varies widely)
- How these codes change – knit, sew and dress making, driving lessons, internet shopping
- Location and co-presence – when does this matter and why?
- Expected to be useful across many areas – consortial funding. Interest from the BBC, and subsequently from companies as well as the public sector.
- Questions about who is spending what time on what and when – opportunities to ‘sell’ services, and make profit.
- Multi-national time use surveys. Politics of participation and issues of harmonisation

TIME	AT HOME	NOT AT HOME	Please enter here details of what you were doing. If you were viewing TV, or listening to the Radio please put a tick in the next column as well.	Please tick if you were				TITLE OF PROGRAMME HEARD/SEEN
				VIEWING		LISTENING		
				BBC	ITV	HS	LP	
2.00-2.30 pm.	✓		Reading					
2.30-3.00	✓		Eating lunch					941
3.00-3.30	✓		Studying					916
3.30-4.00	✓							
4.00-4.30	✓							
4.30-5.00	✓							
5.00-5.30	✓							
5.30-6.00	✓							
6.00-6.30	✓		Eating tea.					941
6.30-7.00	✓		Resting/Reading					961
7.00-7.30	✓		Studying					914
7.30-8.00	✓							
8.00-8.30	✓							
8.30-9.00	✓							
9.00-9.30	✓		Watching T.V.	✓		HS		Radio, Susan = 100
9.30-10.00	✓				✓			and 20 years.
10.00-10.30	✓				✓		5	Hawaiian Eye
10.30-11.00	✓			✓			"	
11.00-11.30	✓		In bed					9/2
11.30-Midnt.	✓							

Comments and Suggestions Have watched "Monitor" before now and found both the programme and Hugh Wheldon decidedly boring and lacking in enterprise.

1961 the people's activities, afternoon and evening: 9th April

Included **ONLY** households possessing a radio OR a TV set

Self-completion (free text) so probably coded by analysts?

Multiple persons in household - no

Secondary activities: limited to eating and use of media

Location: limited to at home and not at home, with some not at home codes included in some activity codes

Who else present - not known (presumably irrelevant to study)

120 codes!

TIME USE

Who wants to know?

1909 The Fabian Society's Women's Group collected daily diaries "from working class women who were "poor" but not the poorest and "respectable" in Lambeth, London with the purpose of revealing both **how these women coped** with raising families on minuscule wages and to reveal the nastier side of life in poverty."

Women's work, child care, economy

Gershuny: that time allocated to both **paid and unpaid production** should be the basis for an alternative form of national accounts and especially one with well-being at its **heart**

Gershuny, J. (2011). Time-Use Surveys and the Measurement of National Well-Being. London, Office for National Statistics.

Media and other forms of consumption

In designing programme schedules to meet the needs of the public it is important to know the times at which people listen and view and what kinds of things people are doing at the same time as listening and viewing

ENERGY

Modelling: orientation and focus

Different traditions of Micro and Macro economics and energy use
Essentially one question: what determines energy use?

Aggregate data sets and a history of modelling

How different factors impact on energy use

Higher emphasis on models and simulated energy use data than patterns and trends

Limited lists of factors
From a review of 26 recent studies

<u>Type of data</u>	<u>Number of citations</u>
Type of building	16
Occupants' income	13
Appliance ownership	12
Price of electricity (bills)	12
Number of occupants	9
Space heating type	7
Floor area	7
Price of electricity (time of use/elasticity)	7
Time use	6
Water heating type	6
Home owner age	6
Weather (temperature)	5
Season	3
Education	2
Weather (not temperature)	1

ENERGY

Key features

The unit is generally the house+appliances, generic 'factors' of income etc. not the occupant.
(no surveys so no respondents)

Factors/variables are pretty constant – they don't change like the categories of time use.

Don't usually consider *when* energy is used

Don't ask about *purpose*: not what are appliances are used 'for' or what are people doing within the home: just quantified efficiency ratings and on-time.

The focus is on averages, not on variations

ENERGY

Summary statistics

Domestic energy
fact file, 2003

- Delivered energy consumption
- Fuel prices, income and energy expenditure
- Population, households and housing stock
- Fabric insulation
- Hot water tank insulation and instantaneous water heaters
- Energy consumption
 - Energy consumption and external temperatures
 - Heat loss of the average dwelling
 - Central heating ownership
 - Heating appliances and efficiencies – central heating
 - Heating appliances and efficiencies – non central heating
 - Heating appliances and efficiencies – condensing boilers
 - Heating appliances and efficiencies
 - Energy consumption by end use
 - Standards of comfort
 - The effect of energy efficiency improvements
 - Comparison of SAP ratings
- How domestic sector energy consumption is determined
- Types of fuel, carbon emissions and primary energy use

ENERGY

Summary statistics

UK Housing Energy
Fact File, 2012

Main topics
unchanged, prices
insulation,
appliances, fuel
mix.

New issues of
carbon emissions,
microgeneration,
and quantifying
the impact of
government
initiatives

- Energy use trends 1970
- Carbon emissions and energy generation trends
- The housing stock, households and bills
- How much energy is used in homes?
 - Energy use and weather
 - Space heating
 - Hot water
 - Lights
 - Appliances
 - Cooking
 - Energy efficiency (SAP) ratings
 - Carbon emissions
- What shapes energy use in homes?
 - Central heating
 - Fuel use in homes with central heating 45
 - Fuel use in homes without central heating 46
 - Condensing boilers
 - Overview of insulation
 - Loft insulation
 - Cavity wall insulation
 - Solid wall insulation
 - Impact of Government initiatives 52
 - Glazing
 - Heat loss
 - Internal temperature
 - Hot water tank insulation
- Breaking down energy use by fuel type
- Renewables and microgeneration

ENERGY

Who wants to know

Anticipating the impact of new prices/tariff structure

Anticipating energy use: e.g. what is the energy load for different types of dwellings based on occupancy patterns, appliance ratings and appliance ownership.

Estimating elasticities/predicting demand

Quantifying the impact of government initiatives

Calculating carbon emissions

State interests; private sector/utility interests

MOBILITY

Travel diaries

National Travel
survey

In general the diary focuses on the purposeful movement of the respondent on public highways (or railways).

The diary documents 'decisions' about mode, destination and timing, and travel 'choices'.

Periodic surveys
1965; 1972/3;
75/6; 78/9; 85/86

These differ in how journeys and purposes are defined.

Continuous survey
1988 onwards

Fewer entries, compared to every 15 min recording of the time use diary. But for each 'event' there is a lot of detail on time – timing, duration, alone/accompanied; mode, purpose, etc.

All people in household – children and adults.

Adult Diary (respondents aged 16 and over) (blue)	Young Person's Diary (green)
Day 1-6	Day 1-6
Purpose of journey	Purpose of journey
Time Left	Time Left
Time Arrived	Time Arrived
Origin - Where the journey started (From Village/ Town/ Local Area)	Origin - Where the journey started (From Village/ Town/ Local Area)
Destination - Where the journey ended (To Village/ Town/ Local Area)	Destination - Where the journey ended (To Village/ Town/ Local Area)
Method of Travel (Car, bus, walking etc.) (Only walks that were more than one mile, or took more than 20 minutes are included)	Method of Travel (Car, bus, walking etc.) (Only walks that were more than one mile, or took more than 20 minutes are included)
Distance (miles)	Distance (miles)
Time travelling (in minutes)	Time travelling (in minutes)
Number in party	Number in party (split into adults and children)
Which car/ motorcycle etc. used (if journey was made not by public transport, but by car/ motorcycle etc.)	Which car/ motorcycle etc. used (if journey was made by car/ motorcycle etc.)
Driver or Passenger? (only if journey was made not by public transport, but by car/ motorcycle etc.)	
How much paid for parking (only if journey was made by car/ motorcycle etc.)	
How much paid for road tolls/congestion charges (only if journey was made by car/ motorcycle etc.)	
Ticket Type (Single/ return/ travel card etc.) (only if journey made by public transport)	Ticket Type (Single/ return/ travel card etc.) (only if journey made by public transport)
Cost (only if journey made by public transport)	Cost (only if journey made by public transport)
Number of boardings (the number of trains/ buses etc. used to reach journey destination) (only if journey made by public transport)	Number of boardings (the number of trains/ buses etc. used to reach journey destination) (only if journey made by public transport)
How much was share of taxi (if journey made by taxi)	How much was share of taxi (if journey made by taxi)
Day 7 additional information requested	Day 7 additional information requested
All walks over 50 yards (including those less than one mile, or twenty minutes in length)	All walks over 50 yards (including those less than one mile, or twenty minutes in length)
	Any time spent in the street not classified as a journey (e.g. playing with friends, skateboarding, riding bikes etc.)

National Travel Survey

1965	1972-79	1985-97	1998-2012
home	home	home	home
work	work	work	Work (+ working at home after 2002)
in the course of work	in the course of work BUT not solely for moving goods	in the course of work	in the course of work
education	education	education	education
shopping – food/grocery	shopping (includes window shopping)	shopping (includes window shopping)	shopping – food/grocery
shopping - goods			shopping – goods
personal business (services.. bank, hair dresser, cleaner)	personal business (services.. bank, hair dresser, cleaner)	personal business - medical	personal business - medical
		personal business - other	personal business – eat/drink alone or at work personal business - other
entertainment, sport, eating and drinking (not public events)	entertainment (not public events)	entertainment/ public social activities (incl watching sport incl. table tennis and darts)	entertainment/ public social activities (incl watching sport)
	Sport (watch)		
	Sport (participate)	Sport (participate)	Sport (participate) judo, karate: - 'vigorous'
	eating/drinking	eating/drinking	eat/drink - social occasions only
personal social travel	personal social travel	visit friends/ relatives at home under 4 nights	visit friends/ relatives at home under 4 nights
		other social	other social
other personal travel (holidays, pleasure etc)	holidays (in UK only) – at least one night away from home	holidays (in UK only)	holiday base (in UK only)
	day trip	day trip/ just walk	day trip/ just walk
Other	other non escort	other non escort	other non escort
Escort	escort x different purposes	escort x different purposes	escort x different purposes

Defining the journey: the shopping trip/s

In the earlier NTS surveys (1965 – 1975/6), a trip **around** the shops was omitted. In 1978/9 a trip around the shops was included as part of the **original trip to the shops**. In 1985/86, the term 'series of calls' was applied to trips made up of frequently broken travel between many stops – so that a trip **to the shops , around the shops and back again** was coded as three trips with the trip around the shops being coded as a series of calls trip.



Defining the purpose of the primary subject: does the other tag along, or is the other's role part of the journey purpose?

The 'escort/accompany' code should **only** be used if the person had no purpose of his/her own. Thus in the above example the child would be coded TO 'Personal business -other' and **not** coded 'escort/accompany'. If there is any doubt whether the person had a purpose of his/her own then the 'escort/accompany' code is not used. For example if a husband drives his wife to the shops and stays with her then he is regarded as shopping, and the 'escort/accompany' code is not used, since it would be difficult to distinguish whether he was escorting, accompany or actually shopping (which includes 'window shopping'). In the case of a young girl with her father on a shopping trip the girl would be coded 'escort/accompany' if she had no purpose of her own in being there other than to be with her father. However, if he was say buying her a coat and it was necessary for her to be there to try it on then she would be coded 'shopping' only, and not coded 'escort/accompany'.



Image credit:
<http://direct.asda.com/george/younger-girls-jackets/duffle-coat-red/G003898602,default,pd.html>

MOBILITY

Key features

- Preoccupied with purpose; and with economy related categories of work, education and shopping. But all types of shopping (etc.) are equal & leisure categories are muddled.
- Multi-stage journeys are a problem – have to define a ‘main purpose’?
- Classification and inclusion (walks over 50 yards; long distance is more than 50 miles).
- Struggle to cope with infrequent journeys and with long distance travel
- Travel itself all consuming: don’t ask what happens in travel time itself, e.g. how is journey time used. Is travel itself leisure?
- Include ‘accompanying/escorting’ but no more than that in terms of sociability
- Don’t include travel involving the delivery of goods. Exclude travel as part of work – taxi, fire engine etc.

MOBILITY

who wants to know?

“The survey is primarily designed to track long-term development of trends in travel, although short-term changes can also be detected.”

It has been used to reveal :

National and local planning
Monitoring trends - in terms of mode, destination and timing

- Growth in the suburbs and concomitant growth in personal travel
- Increases in household vehicle ownership alongside reductions in household size
- Impact of the baby boomer generation on travel
- Increases in women’s travel
- Long distance or stretch commuting
- Growth in average trip length – especially for social and recreational purposes
- Greater mobility of specific subgroups – particularly the young, the old
- Changes in the mix of trip purposes, particularly the growth in non-work travel, including the propensity to make stop[s] on the way for work

Summary: Comparing across the cases

	Time	Energy/buildings	Mobility
Purpose	Coded categories	Don't care	Coded categories: much debate
Units/scale	10 minute slots	Metered/seconds	'travel events' across a day/week
Duration	Itself the topic	Estimates (appliance use)	Journey time
Timing	Recorded, could be analysed, often not	So far ignored	Detailed information start and end times.
Frequency	Not much insight	Don't care (averages)	Hard to handle infrequent (long distance) journeys
Individual/household/collective	Individual – some data on co-presence	Don't care	Individual plus – escorting/accompanying
Multiple purposes/multi-tasking	Primary and secondary activity	Don't care	Primary and secondary purposes
Virtual living	Internet use, computing	Don't care	Teleworking (2002), ordering online.
Spatial reference	Home and away	Only within the home	Only away from the home

Summary: Common features

- Implicit focus on productivity, employment, societally/morally 'good' purposes and uses of time.
- Linearity: massive problems of multi-tasking; virtual time-space; sharing; storage e.g. hot water/batteries (energy not mobility); substitutions; adaptations.
- Struggle with infrequency across the board.
- The individual (unit): topic of enquiry, analysis, decision-maker; choice; user/consumer.
- Analytically homogenised 'categories' of purpose or destination; emphasis on averages not on variations.
- Nothing on how the meaning and character of work or leisure itself changes over time or how the range of appliances, practices and destinations/purposes evolves.

Discussion: Would this fantasy integrated 'diary' help?

TIME/ ENERGY/ MOBILITY DIARY	Foreground energy/mobility use	Shared by No of people.	Background energy/mobility use	Purpose	Energy per unit of service? Per person?
7.30 am	Alarm clock radio on	2		Waking up/informing	
7.45		1		Personal care? Being able to see what you are doing.	
		1		Personal care	
8.00	Kettle (3 mins) Toasting*(5 mins) Charge phone; charge laptop	3 3 1 1	Lights of Storing energy, later use		
8.30	Radio off. (or time on, time off) Dishwashing	? 1 c be		How	
8.45	Walk to bus stop. Using mobile phone on the bus**	1 1+	... was on its way; internet and mobile phone system functioning	Chatting accompany (virtually)	

Issues of substitution/adaptation

Multiple appliances, one practice

Background and foreground energy use?

Energy stored for later use

What is standby mobility?

Virtual company?

*Toaster broken, so grill used instead. ** Energy from home used on bus.

Discussion: Alternative indices?

- Societal synchronisation index
- Chart atlas of contemporary practice
- Fossiliation, innovation, transformation index

Conclusion

Data collection and analysis mirrors the way (policy) problems are defined and framed

- *The energy used in buildings and for mobility is an outcome of what people do: the practices in which they are engaged, and how they spend their time.*
- *Changes and variations in energy demand relate to changes and variations in practice.*

This is not the normal starting point

- *Data reflects dominant premise that energy/ mobility is the product of the system itself and can be predicted*
- *There are implicit theoretical models (policy impact; choice; causal variables) which are all somewhat questionable, but reproduced in the data itself (we are what we measure)*
- *We have to ask new questions of existing data (which is imbued with specific histories).. E,g use NTS data to understand rhythms of practice over the week; understand variability and difference, not stability and averages*
- *BUT only new policy paradigms will deliver/foster/favour suitable forms of data collection and analysis*