The Oil Drum: Campfire

Discussions about Energy and Our Future

Cycle-touring: a vision of post-peak holidays?

Posted by Chris Vernon on April 25, 2010 - 10:25am in The Oil Drum: Campfire
Topic: Environment/Sustainability
Tags: alternative transportation, bicycle, europe, peak travel, travel [list all tags]

This is a guest post from Robin Lovelace (email: www (dot) lovelacerobin (at) yahoo (dot) com), a PhD student in energy research at the University of Sheffield, UK.

This post was inspired by single bicycle holiday: an Easter cycling adventure around the Spanish Pyrenees. While the experience proved that cycle holidays can be fun (its primary purpose), it soon became clear that the single case study could provide a basis for practical advice and broader discussion. The former (stuff, planning, safety, money) may be of use to aspiring low-energy holidaymakers. The latter (energy analysis, viability) may be of interest to those who want to think about low energy futures.

Part 1: Practical advice

Stuff

Deciding what to bring is important because the amount and type of stuff you carry will affect many aspects of your journey, including:

- The range of places you can stay – a tent can expand the area in which you can sleep, as can quality clothing and gear. Food stuff ranges from simple and light (simply buying food along the way) to complex and heavy (cooking paraphernalia), also affecting your range.
- The speed and ease of travel – influenced by the decision to pack heavy or light, although the suitability of your bicycle and your body for the job may be dominant factors.
- Your ability to do things away from your bicycle – if you want to go on a walk, eat at a restaurant, or go for a night out, you may be encumbered by expensive, bulky equipment.
- Being able to set-off far from home – use of some kind of motorized metal box may be needed to begin far from home (but have you explored your local area?) For this you may need to disassemble your bicycle[1], and alter your packing plans.

Organising your stuff into the following categories (bike, food, hygiene, and magical stuff) may help order your thinking, and the way you pack your bags.

All the stuff brought for the journey. Preparing to camp at 1400 m altitude just before entering the 3 km Bielsa-Aragnouet tunnel: a cold night.

Bike stuff

A reliable bicycle is a prerequisite. If your bike fails, your holiday could come to a premature end. Strength and durability make a good bicycle for touring, but unfortunately these traits are rare in the polarised new bicycle market[2]. Fortunately, there are three tried and tested options:

- Old mountain bike conversions can be cheap and effective (but be sure to avoid the pitfalls of this option).

- Second-hand touring bikes are more efficient, but may need to be taken to a workshop before they are ready for the job (as in the bicycles shown in the photos).
- Established manufacturers continue to produce ever-improving off-the-shelf touring bicycles, some of which are virtually bomb-proof[3].

Once you have a voyage-ready machine, think about what you might need to maintain it on the road. Useful items to bring, in descending order of essentialness are

- A bicycle repair kit (including tire levers) and pump capable of inflating to at least 40 psi.
- The correct hex keys (Allen keys in the UK), screwdriver, and (adjustable) spanner to for your bike(s).
- Chain tool (so if your chain snaps, you can fix it).
- Oil, to lube the chain and prevent rusting in wet conditions

More advanced tools may be an unnecessary burden, but spoke keys, spare brake pads, and pliers may come in handy. The best guard against bike failure is to ensure it's in tip-top condition before heading off. The same applies to your body.

Good panniers (containers attached to your bicycle) are near-essential cycle touring gear. Get a decent pair from your local bike shop, and ask to test them on your bike before you buy.

Food Stuff

When cycling a long distance for the first time, you may experience something extraordinary: the conversion of your body into a biological engine. As a result, you will require more food (~20 kcal/km or more, terrain and load depending)[4], so it is important to maintain a regular intake of food and water throughout. Ranging from simple to complex, the options are:

- Buy food as you travel: if the places you pass through contain good food, it can be rewarding to check out the local cuisine.
- Bring food with you: little snacks such as nut mix and dried fruit can keep you topped up, while bread, biscuits and local toppings can make for tasty meals on the road. Water 's high density means it may be best to collect as and when it's needed (environment permitting), but carrying at least a day's supply is recommended. Penknife: near essential.
- Cooking your own food: generally not to be recommended due to the time, weight, and hassle of this option. However, a small gas stove can provide warming refreshment during cold nights, and hot food during expeditions into remote lands.

Get the right mix of these options and you could live like royalty.

Hygiene stuff

Obvious, but worth mentioning the basics: Soap (can be employed for clothes and body washing), towel (or woolly jumper), clean clothes (a pair of clean socks at the very least), toothbrush.

Magical stuff

These things do not have supernatural powers,[5] but have an unusual capacity to collect, store, process, and eventually transmit information. Useful magical items may include a camera, a diary, a GPS unit, a mobile phone and books (e.g. about the local language, history, or plants). Be warned however: you'll have plenty to do on the trip so some 'magical' items may magically convert themselves into useless dead-weight.

All the stuff packed and raring to go. Heading towards the mountains.

Planning

Cycle touring can bring back the holiday's sense of adventure that has been lost in so many gas stations and airport queues. Unlike in a car or a plane, you can pull over and stop practically anywhere: admire the view, take a rest, or set off on foot without worrying too much about parking tickets or theft (for the latter you may need a shabby bike and good lock).

However, a rough plan is near essential (detailed planning is covered here). Work out a feasible distance per day (30, 50, or over 100 km may be realistic, depending on fitness levels, the terrain, loading, and the suitability of your bicycle for the purpose) and see which features lie on your projected path. Camping ground, hostels and shops may be things to look out for; you may be able to guess the location of these things based on knowledge of the area. Simply jotting down where you want to arrive at each day may be enough – the first three days of the trip to the Spanish Pyrenees were planned as follows:

25th: Toulouse to Lannemezan (116 km)
26th: Lannemezan to Ainsa (100 km)
27th: Ainsa to Huesca (100 km)

While the plan was not followed exactly (less than 60km per day were covered after Ainsa, due to unexpected hills and distractions), it didn't matter because a 12 hour margin of error was planned for. The point is to make a plan.

Select and use the most effective method of mapping and route planning for your circumstances, and try to get a feel for the region before you set-out[6].

Checking a local guidebook to find abandoned villages 10 km west of Ainsa. It's fun to leave plenty of room in your plan to improvise.

Safety

It is difficult to hurt yourself or others when riding bicycles away from cars and cliffs. This is one of their main attractions; bicycles offer a level of tranquillity and quietness unavailable to motorized holidaymakers. Cars and trucks, however, pose a serious threat to anything that dares to stray near their path. For this reason, it is worth taking the following steps:

- Avoid busy roads. Use bicycle lanes wherever possible, unless you are an experienced road cyclist.
- Bring bright lights if you plan to do any cycling in dark conditions. Entering tunnels can be scary, but personal experience suggests it can be no more dangerous than road riding, if you have good lights.
- Practice cycling fully loaded on roads before you head out. This experience may prove valuable if you ever need to hold your nerve in traffic.

Safe cycling involves feeling secure in the environment. Avoid situations you do not feel comfortable with. About to enter a watery tunnel between Bielsa and Ainsa.

Money

Cycle touring can be the cheapest way of getting from A to B, especially if you factor in the cost of a car. It is extremely satisfying to spend fuel money that would otherwise have gone towards multinational oil corporations on your body's fuel: fine foods and drink. On one mini-tour, (from York to Sheffield) the exact saving from the train ticket was spent on a full-English breakfast, which more than compensated for the extra time.

To provide a general guide, the finances of the Spanish cycling trip were:

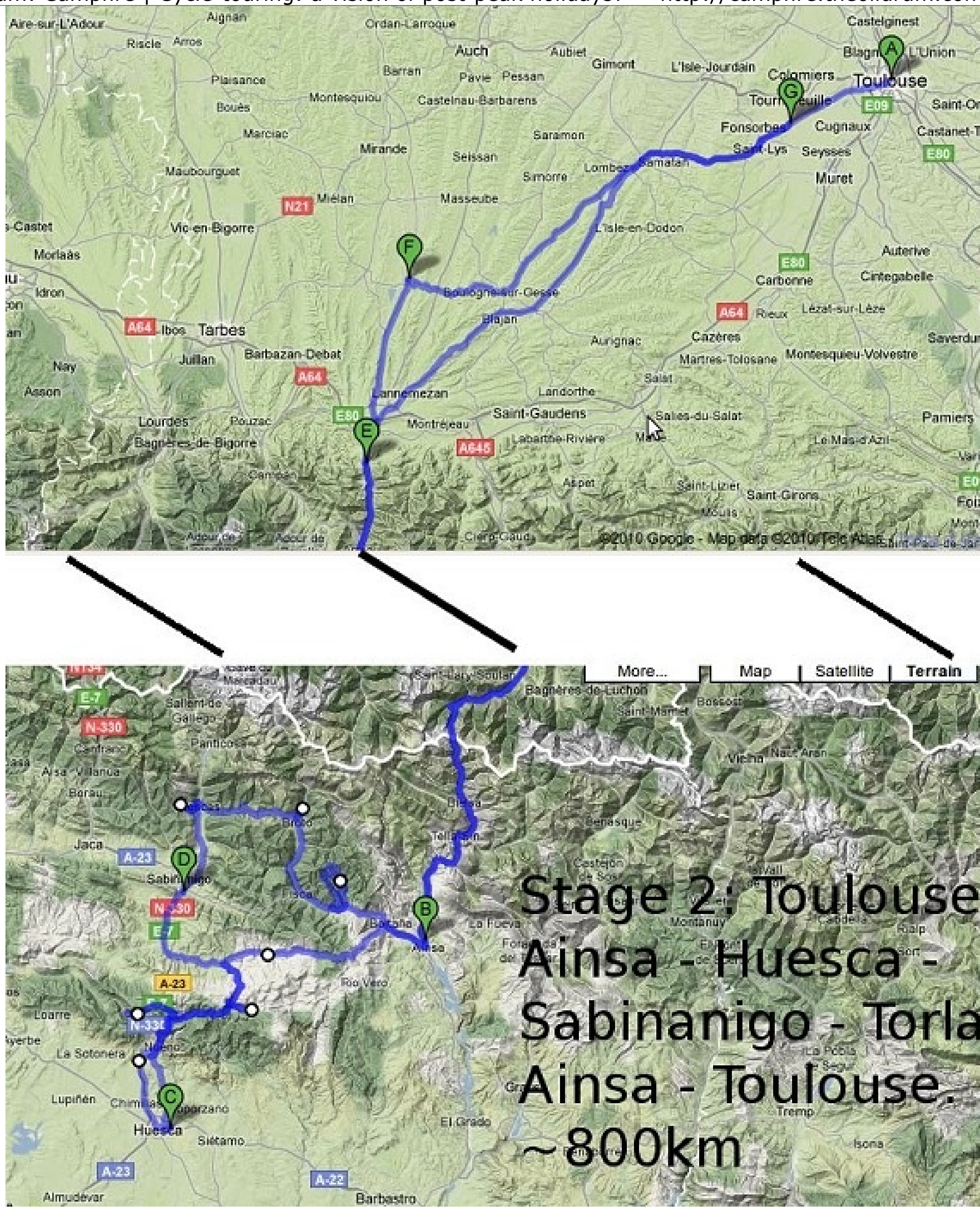
- £150 return ticket, Sheffield to Toulouse, using Eurostar and Rail Europe.
- £250 spending money, including food, 2 nights in hostels, camping, and restaurant meals.
- £200 invested in stuff before departure: new wheels, brakes, tires, stem, bottom bracket, chain, cassette for the bike; new thermal vest, sleeping bag liner and book (David Strahan's razor-sharp Last Oil Shock) for the ride.

If you divide these costs (some of which will make the next trip cheaper) by the 10 days of travel, the daily spend amounts to £60 a day. It would be possible to do it much more cheaply if you set off from your house by bicycle, used a cheaper kit, and spent less time in hostels and restaurants.

Part 2: Discussion

Energy analysis

In an interconnected, complex system such as the real world, system boundaries must be drawn in order to conduct quantitative energy analysis (Smil, 2008). The following energy analysis uses two components of energy use (fuel and embodied energy of vehicle manufacture) to compare the energy costs of two alternative holidays: the 10 day cycling holiday outlined in the words and pictures above, and an imaginary 10 day holiday by car which covers exactly the same ground (maps below). The distances travelled by mode are 2500 km by train and 800 km by bicycle in the first holiday and 3300 km by car in the second. This gives us a start-point for analysis.



Maps of the two phases of the route.

Fuel costs

The fuel requirements for holiday 1 would be 1500 MJ for the train and 575 MJ for the 800 km travelled by bicycle[7]. This results in an estimate of 2075 MJ of energy for fuel for holiday 1. The fuel requirements for holiday 2 are estimated to be 5610 MJ per person, double those of holiday 1[8].

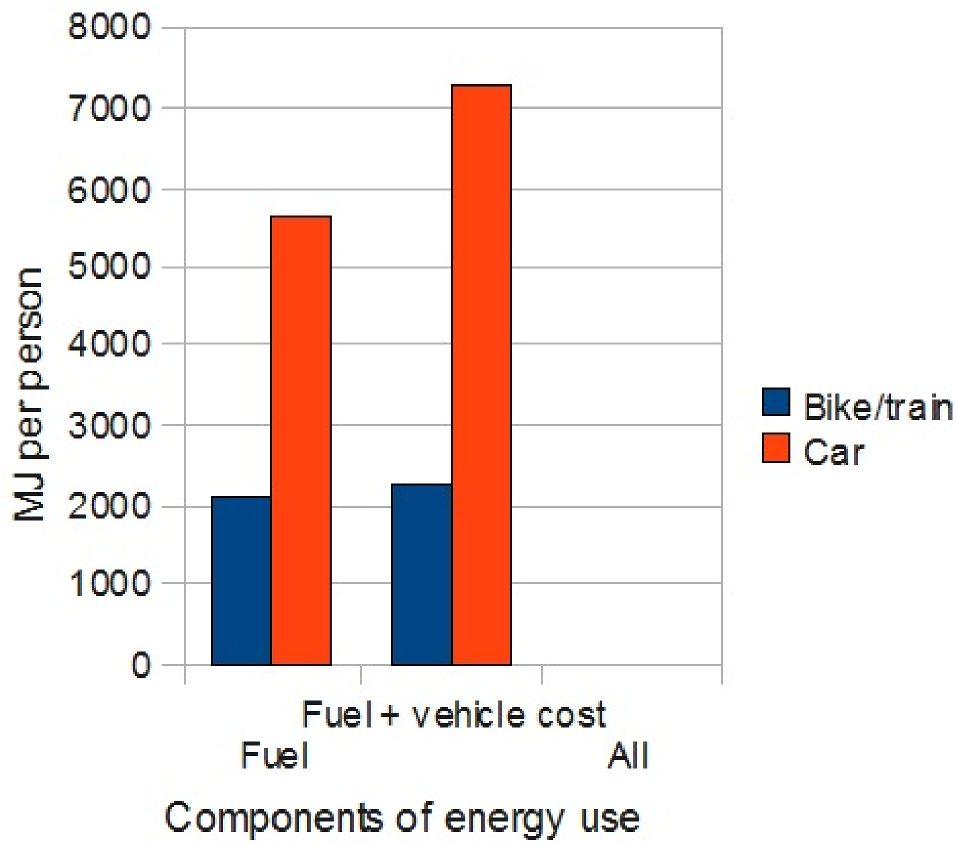
Embodied energy costs of vehicle

The embodied energy of vehicle manufacture can be included per unit distance by dividing energy costs by expected lifespans (Fels, 1975; Lenzen, 1999). In the case of holiday 1, total energy requirements increase by 150 MJ to 2225 MJ when we include the 3.73 GJ energy cost of bicycle manufacture[9].

Including the embodied energy of car manufacture (almost 300 GJ!), the energy requirements of holiday 2 increases by 0.5 MJ/km per person to 7260 MJ[10].

System-level energy costs

But what about the energy costs of road maintenance, advertising, money-hunting (in order to gain capital for car purchase) and social change brought about by our transport systems? Fels (1975) and Lenzen (1999) have had a shot at estimating the former of these costs, but the true extent of the latter are impossible to quantify. Let's at least visualize the energy costs we can estimate:



Estimated energy use from fuel and fuel and vehicle manufacture.

The energy analysis done so far illustrates that bicycle trips use relatively little energy, even when used in combination with trains. The inclusion of energy costs for vehicle manufacture affects cars more than bicycles. This is no surprise: cars (weighing ~1000 kg) require about 100 times more raw materials, and hence embodied energy, than do bicycles (weighing ~10kg). As the system boundaries are expanded, it is expected that the energy costs of cars will continue to increase, while the energy costs of bicycles may begin to fall (as bicycle use degrades roads slowly relative to car use and may encourage others to cycle). This expectation requires testing against reliable evidence, however, hence the blank “all” category in the graph. Filling this gap could be an interesting research direction.

A viable vision?

So bicycle holidays can be fun and energy saving. They use far less oil, which is the most rapidly depleting of the fossil fuel, than do car or plane-based holidays. But are bicycle holidays viable in a post peak future? This is an open question which I put to the readers. My only answer is I hope so.

The vision.

Footnotes

1. If you disassemble, you will probably need some kind of bag to put you bicycle in. If you have somewhere to leave this bag at the beginning of the pedal-powered stage (e.g. a friend's house, or stashed in a tree), you have a wide range of options from expensive inflatable bike bags to the bike-sized cardboard boxes disposed of by bike shops on a regular basis (the latter works well with duct-tape). If you want the freedom of a portable bike bag, the options are more limited. You could buy a polythene bike bag (this particular model is cheap, but short lived), buy a hardier but heavier item (this ~2 kg item was a passenger on the Spanish trip, a lot of extra weight when climbing hills), or, if you are feeling inspired, make your own.
2. New bicycles tend to be either super light, skiny racers that cannot hack panniers or gravel roads, or lumbering suspension-wielding tractors that are barely road worthy. However, you can get the best of both worlds if you search.
3. The Surly Long Haul Trucker, Thorn Raven, and Dawes Galaxy are some of the legendary touring bicycles that you can buy off the shelf. Such high-quality tourers also make for sturdy commuters and all-rounders that will, if maintained well, last a lifetime. For a review

of some of the better new options, see a bicycle touring guide.

4. Coley, David A.: Emission factors for human activity, Energy Policy 30(1), volume 30, 3–5, 2002
5. In his book *The Long Descent*, John Michael Greer sees magic in a broad sense. For example, the subtle power of marketing to influence your behaviour. It is useful to term such things as magical (or a different term if you prefer), to demarcate their ability to influence complex systems with relatively little energy input. A broad definition of magic is "has a mysterious quality of enchantment", although clearer definitions must exist.
6. Google maps offers a fast and effective route planner, and although it has yet to provide for cyclists (sign the petition here), the "walk there" function is adequate for most tasks, especially when on holiday in the countryside. Copying and pasting the maps can be a hassle though, and it is always advisable to get a decent map of the area (sometimes these are provided free in tourist information offices). For the sophisticated cycle tourist, a GPS may be desirable. The mapping community at www.openstreetmap.org have created an open source cycle map of the entire world. What is even more exciting for techies is that you plan your route online, and then save it as a gpx file on your gps as you go. This high-tech approach is extremely useful, especially if the location is well served by open-source maps (so if you have a GPS, you can improve the map yourself). However, low-tech maps, and asking for local knowledge may be preferable for low-energy travellers, and those seeking rustic adventure.
7. The per-person energy requirements of a train can be estimated as 2500 km multiplied by 0.15 MJ per pkm (for TGV train) multiplied by 4 (assuming efficiency of electricity production is 25%)). The energy requirements of a bicycle can be estimated using the knowledge that approximately 30 kcal (0.125 MJ) of additional food energy are required per km cycled. Given that 5.75 units of primary energy are required by unit of chemical energy in food (Coley, 2002), additional energy requirements are 0.125(MJ/km)*800(km)* 5.75. If you eat good, local food on your travels, the energy costs may fall.
8. Average fuel economy of the UK fleet is currently 8.55 l/100 km (3.4 MJ/km) (Mackay, 2009), and average occupancy is 1.6 (let's assume you travel with 2 on board). 3.4*3300/2 = 5610. This estimate would be slightly higher (~10%) if the embodied energy of fuel production and transport were included, higher you drive a bigger car (as many holidaymakers do), but lower if you travel with more people. Hills may also make your car drink more petrol, but let's stick with the estimate for now.
9. The average lifespan of a bicycle is expected to be 20,000 km (this can be greatly extended by good maintenance practices and the replacing of specific parts rather than the entire bicycle when one part is broken). Under these assumptions, per km embodied energy is therefore 3.73 GJ divided by 20,000 km = 0.186 MJ/km. 0.186*800 = 148.8 MJ. The embodied energy of the train was expected to be negligible compared with the distance travelled, as it transports up to a million passenger kilometres each day (1000 km per day * 1000 passengers). The embodied energy of the nuclear power stations that power the train? That's a different matter entirely.
10. The embodied energy of a car manufacture is estimated at 274 GJ (274*10^9 J) (MacKay, 2009:94), or a third of the vehicle's total fuel needs over a lifespan of 250,000 km. Assuming optimistically that the lifespan is 250,000 km, embodied energy costs per km increase by 1 MJ/km; total energy costs per person increase by 0.5*3300=1150 MJ.