

Off-grid lighting and phone charging study

A snapshot of household technologies, habits
and expenditure in Malawi

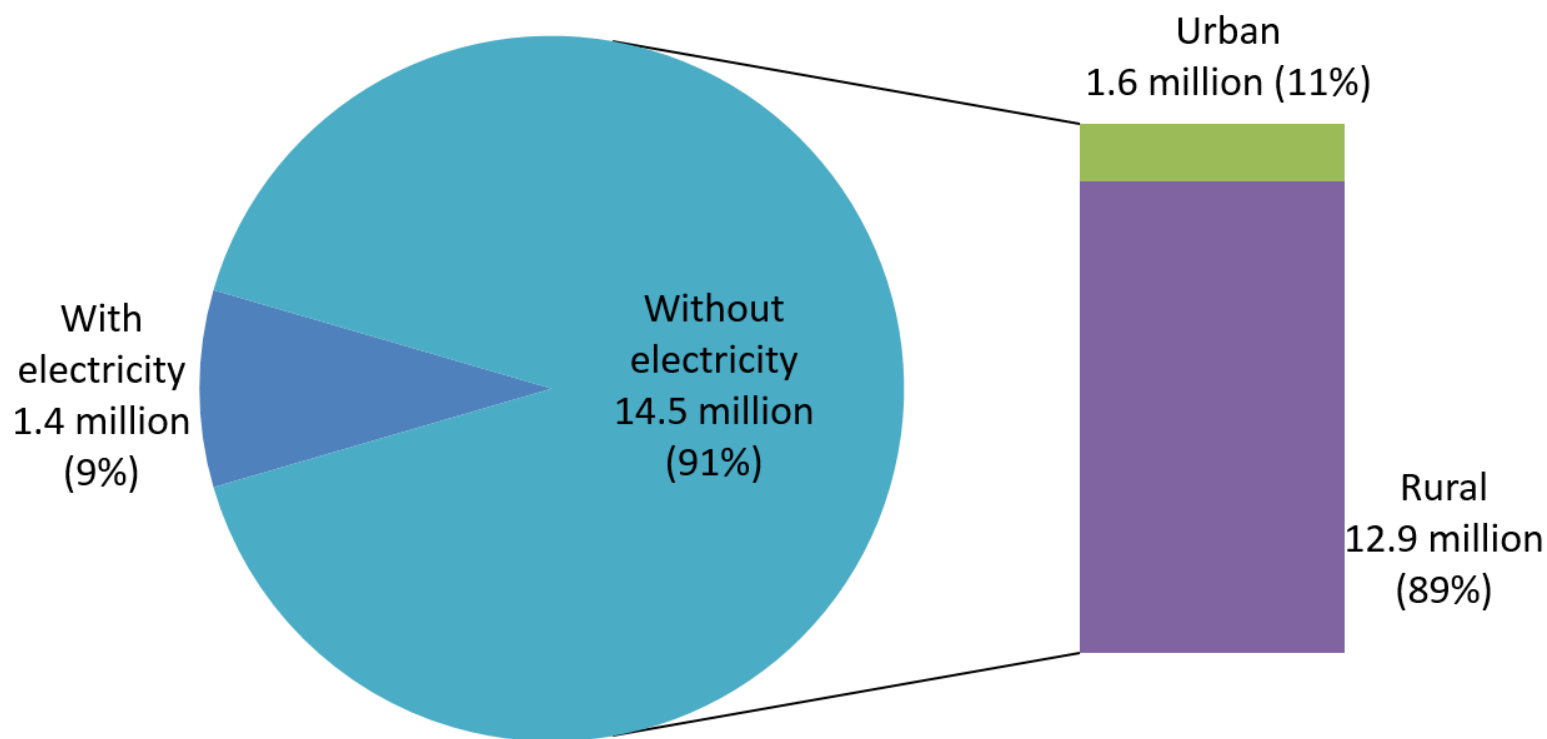


August 2016

Background



Malawi has one of the lowest electricity access rates in the world, standing at only 9%; the problem is particularly acute in rural areas where only 1% of the rural population has electricity access.



Background



- Household solar products offer the best potential for rapidly increasing access to modern energy services in Malawi.
- Technological advances bringing increased quality and lower prices, coupled with business innovation has enabled a boom in the household solar industry - 7.5 million quality-verified solar lights have been sold in Africa. The products provide bright light and mobile phone charging, and the cheapest are now available for just \$8.
- Alternative methods of lighting such as kerosene, candles and torches provide low-quality light are damaging to health, are dangerous, and actually more expensive than modern electric lighting. However modern products are yet to gain a significant market share in Malawi.
- Furthermore, relatively little is known about off-grid consumers lighting and phone charging habits.

Study goals



The goal of this off-grid lighting and phone charging study are:

- Raise the profile of the off-grid market amongst key stakeholders (private sector, government, financial service providers, media)
- Highlight the opportunity for private sector growth in the off-grid lighting and charging market
- Encourage further private sector investment through improving the understanding of consumers

This study explores key consumer insights:

- What are the prevalent lighting technologies and how they are used.
- Lighting and phone charging habits and expenditure
- Awareness and perceptions of household solar products

Methodology



- Nationally representative survey covering 7 districts randomly selected from Northern, Central and South regions. Data was collected face to face, in-home using computer assisted personal interviews (CAPI) method of data collection. The questionnaire was structured and programmed onto hand-held devices.
- The sample was purposive, off-grid constituting n=513 respondents/households. Households and respondents were randomly selected. Individuals with a grid connection were not included in the sample.
- The respondent was either head of the household, spouse, or any other adult member.
- The survey was conducted in February and March 2016.

Structure of sample



District	Classification	Village	Township	Sample Size	District Total
Blantyre	Urban		Bangwe	18	36
			Nancholi ward	18	
Zomba	Urban		Sadzi	18	36
			Matawale ward	18	
Lilongwe	Urban		Chilinde	18	36
			Area 25	18	
Mzuzu	Urban		Chiwanja ward	18	36
			Chiputula	18	
Rumphi	Rural	Mwangóna	Mzongano	41	123
			Chiulazeru	41	
				41	
Chikhwawa	Rural		Sekeni	41	123
			Nedi	41	
			Mthumba	41	
Salima	Rural		Mzalule	41	123
			Makunje	41	
			Mazombwe	41	
Total				513	513

Household Solar Product Categories



Solar portable lights (SPLs)

- Single light sources with or without mobile phone-charging outlet
- Entry-level products with solar panels of 10W and below
- Prices range from less than \$10 to \$40



Solar home systems (SHS)

- Multi-light source applications with mobile phone charging outlet
- Sources can power devices such as radios or small televisions
- Prices range from \$50 to \$200



Large solar home systems

- 12 volt systems replace diesel generators or car batteries
- 12 volt systems can power multiple lighting points and devices such as televisions and refrigerators
- Prices start at \$200

Lighting Africa Quality Assured - 135 products from 40 manufacturers



Summary and interpretation of findings

Summary of findings



Solar lighting penetration

- Penetration of household solar lighting in Malawi is still at its infancy.

13% of off-grid households were using solar lighting: 9% portable solar lights and 4% fixed solar lights

- Ownership varies significantly between households in urban and rural areas, and between districts.
- Two thirds of off-grid households use battery-powered torches (63%) followed by candles (14%)

Income and solar lighting adoption

- Income level determines penetration of solar household lighting, with greater ownership amongst higher income houses.

National and household expenditure

- Malawi spends nearly \$50 million (MK 34 billion) on bad quality and harmful lighting every year.
- Average annual spend per household on lighting = \$14 (MK 10,000) and phone charging = \$9 (MK6,000).

Income, mobile phone ownership and solar lighting relationships

- Low household income is not a significant barrier to mobile phone ownership.

81% of households using solar lighting had a mobile phone as opposed to 58% of households that were not using solar lighting

- Households typically own more than one mobile phone.
- There is a strong correlation between mobile phone ownership and solar lighting usage.



Summary of findings

Phone charging behaviour and costs

- Most phones are charged a few times in a week (from once to thrice). Phone charging is an accessible service as people take on average 15 minutes to reach the nearest charging station.

It takes 15 minutes to reach the nearest phone charging point

Motivations for main source of lighting

- Households using solar lighting were motivated by affordability (long term savings 41%), brighter light (18%) and its reliability (available everyday 15%). Non users were motivated to non renewable lighting solutions by affordability (short term affordability 65%). And local availability (13%)

Affordability is the main driver for selecting a lighting solution. Affordability for solar lighting is perceived in terms of long term savings while for non renewable sources its on the unit cost of acquisition

Awareness of solar lighting and its benefits

- Word of mouth is the biggest driver of solar lighting awareness 90%). Radio comes a distant second (16%).

92% aware of solar lighting. 63% mention long term cost saving as the biggest benefit of solar lighting

- The following benefits are mentioned of solar lighting: Cost saving the long term (63%), brighter light (29%) phone and radio charging capability (23%) and safer than other alternatives (13%)

Summary of findings



Solar lighting usage patterns

- Solar lights once in the household are used more than any other lighting source (about 7 hours daily; suggesting both early morning and evening usage).

Purchasing solar lighting

- Grocery stores and markets are mentioned mostly as the points of sale where solar products would be available (53% and 43% respectively).

- There is a significant difference between users and non users with 71% of users claiming they know an outlet where solar products are available as opposed to 37% of non users.

Distance to the nearest point of purchase

- Both users and non users of solar lighting who are aware of an outlet selling solar products mention that it would take them an average of one hour or less to reach the nearest outlet.

Solar lighting price awareness

- Asked to estimate the price of solar products, most users and non users of solar lighting gave close estimates to the correct market prices. Users estimated prices of PSPs at the price of medium-end PSPs (46,000 MK), non-users gave prices close to entry-level PSPs (9,000 MK).

Satisfaction with main lighting source

- Solar lighting records the highest level of satisfaction (portable solar 71% and fixed solar 55%). Torches and candles which are the most used lighting methods record the lowest level of satisfaction (35% and 41% respectively).

Summary of findings



Interest in solar lighting

- There is a big interest in adopting solar lighting. 78% of current non users are interested in getting solar.

78% of non-renewable lighting users are interested in acquiring solar lighting

Barriers to solar lighting acquisition

- Perception of solar lighting being expensive and genuine lack of money are the 2 biggest barriers.

Where as 55% of current users of solar lighting mention lack of money, 40% of non users attribute lack of money as main barrier. Only 34% of current users mention expensiveness as main barriers as opposed to 57% of non users.

Drawbacks of main source of lighting

- The main drawback of solar lighting from current users is the reduced performance on cloudy/rainy days (58%). This is mentioned as the only drawback.

Users of non renewable sources mention that their current sources of lighting are expensive (29%), break down frequently (25%) and are dangerous (17%).

Warranty: Awareness and value attached to it

- 58% of off-grid households were aware of a warranty. Users were however more aware (73%) as opposed to non users (56%).
- Households are willing to pay more for products with warranty at a similar proportion of both current users and non users of solar lighting (94%).



Survey findings

1. Solar lighting penetration and profile of users versus non-users
2. Lighting habits
3. Lighting costs and associated expenditure
4. Awareness of and attitudes towards solar lighting
5. Finding the target market

Household penetration of solar lighting

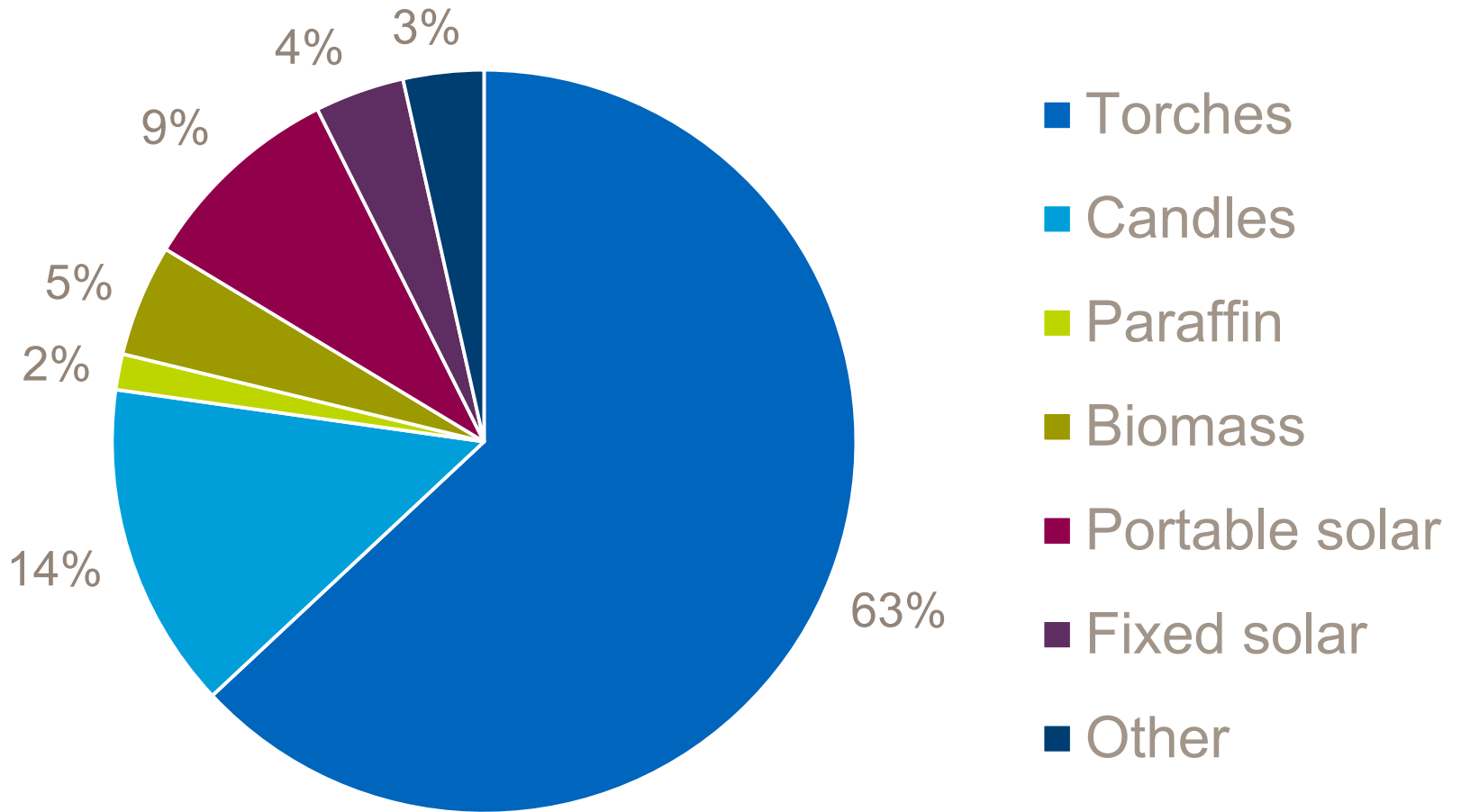


13%

- 13% of off-grid households in Malawi – representing 2 million people - are using solar lighting
- This includes portable solar products (9%) and fixed solar systems (4%)*
- The solar power market serves more than 1.5x as many customers as ESCOM
- 63% of off-grid households use torches with batteries for lighting

* Product quality was not assessed by the survey. This figure includes non-verified and quality-assured products.

Primary source of lighting





Solar penetration by district

	Urban				Rural		
	Blantyre	Lilongwe	Zomba	Mzuzu	Rumphi	Salima	Chikwawa
Portable solar	6%	6%	0%	3%	13%	2%	19%
Fixed solar	0%	3%	0%	3%	6%	9%	0%

- High penetration in Rumphi and Chikwawa where products have been aggressively promoted by prominent distributors and donors

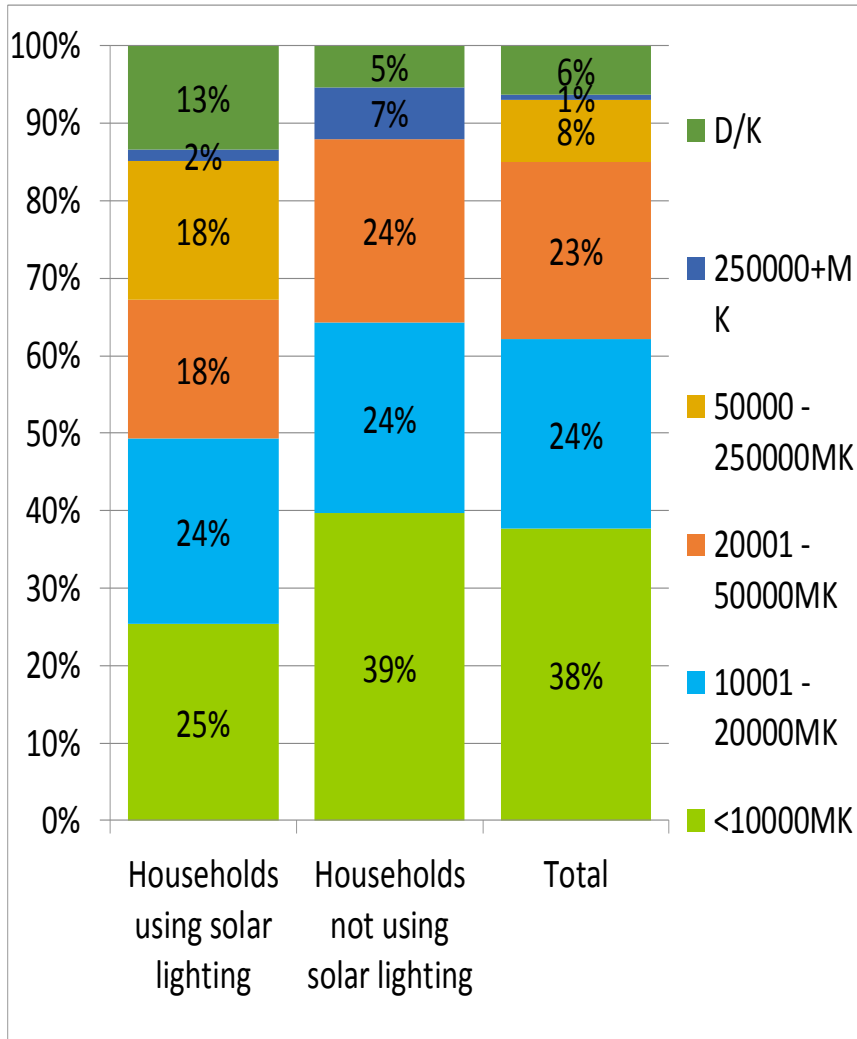
	Urban average	Rural average	National average
Portable solar	3%	11%	9%
Fixed solar	1%	5%	4%

- Market penetration higher in rural districts. Urban consumers commonly cite product security as a risk.

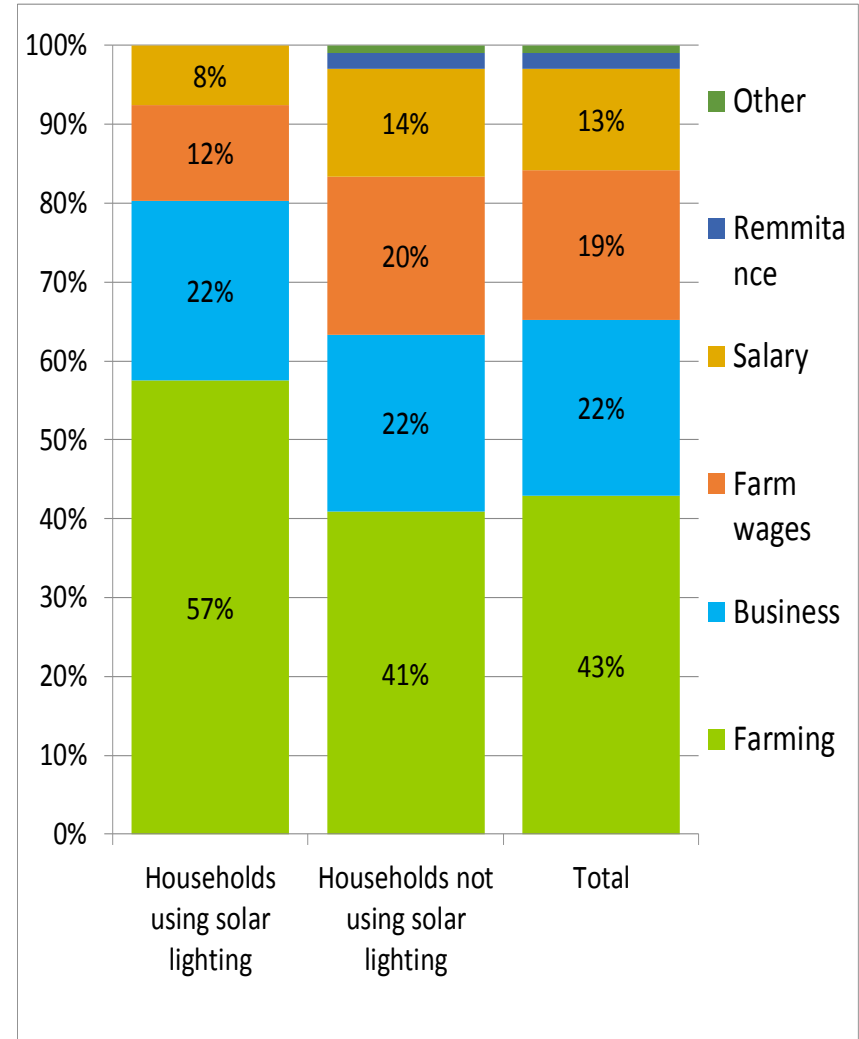
Profiles of users and non users based on household income & source of income



Monthly household income



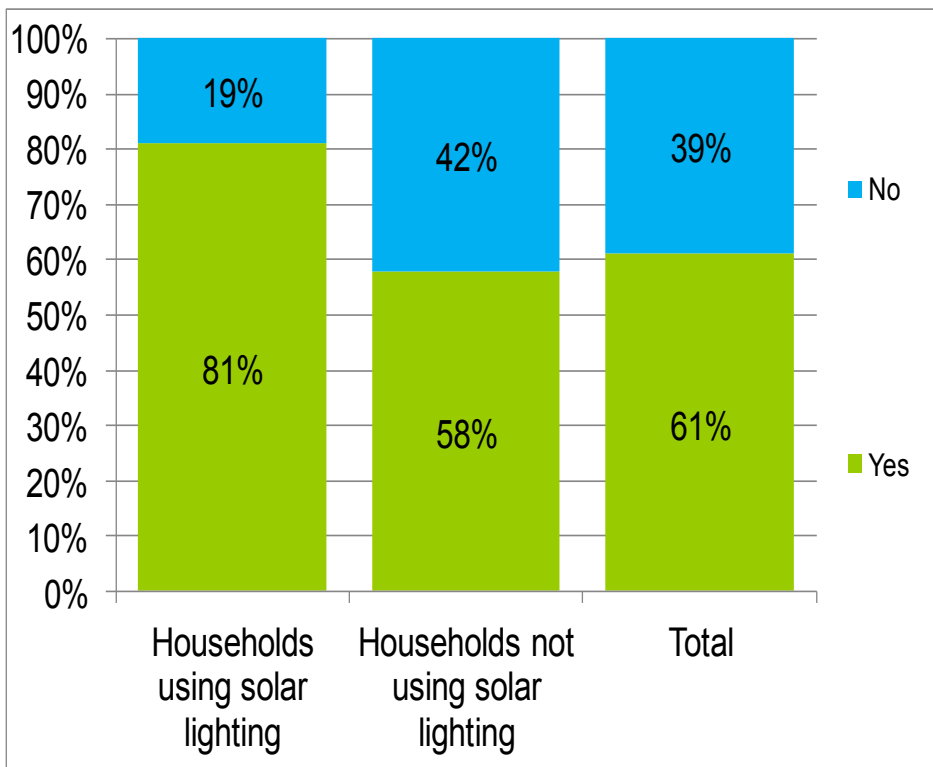
Source of income



Profiles of users and non users based on mobile phone ownership



Whether household has mobile phone



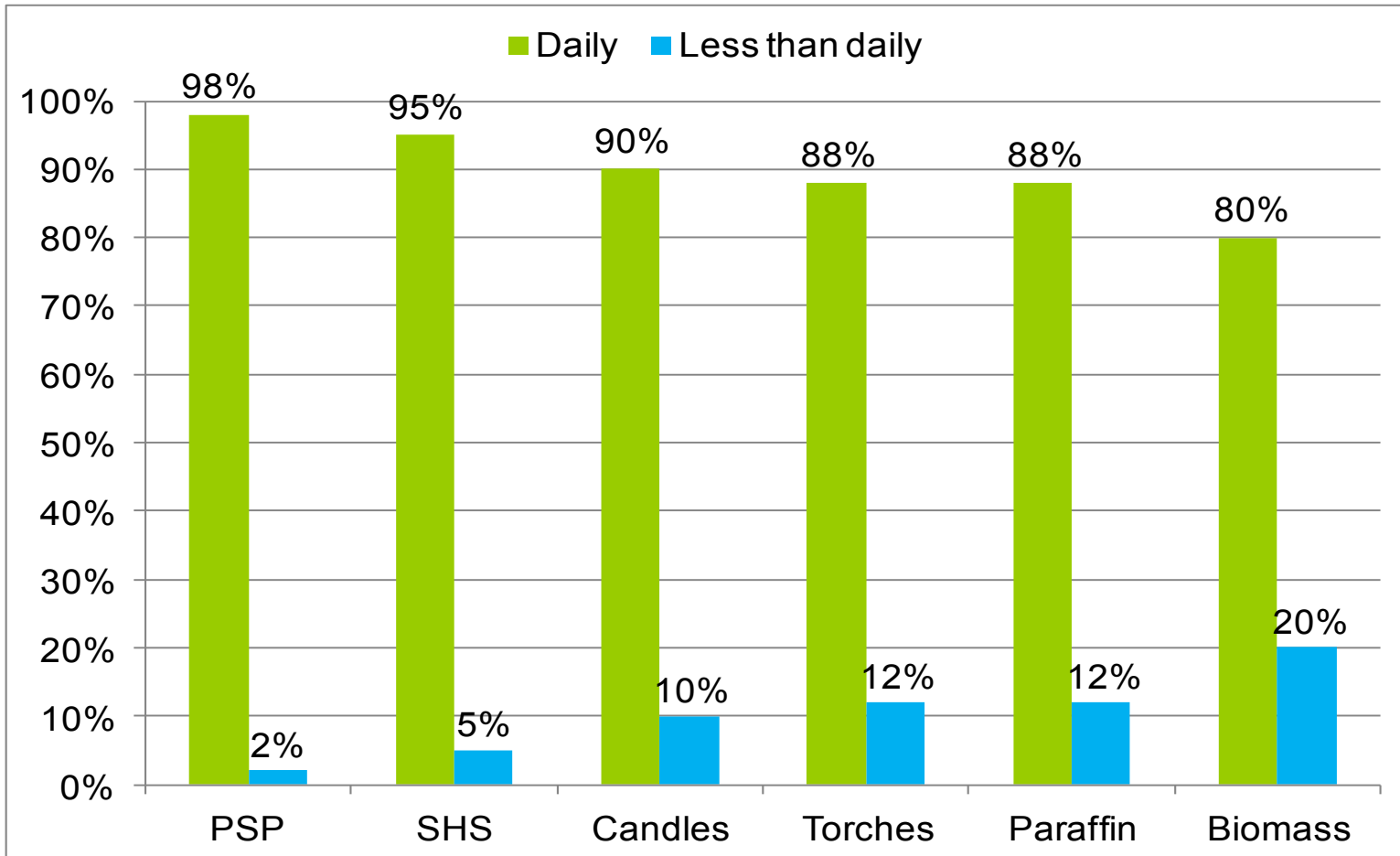
Number of mobile phones in households

	Number of mobile phones
Households using solar lighting	1.81
Households not using solar lighting	1.58
Total	1.62

Lighting habits



Frequency of using main lighting source



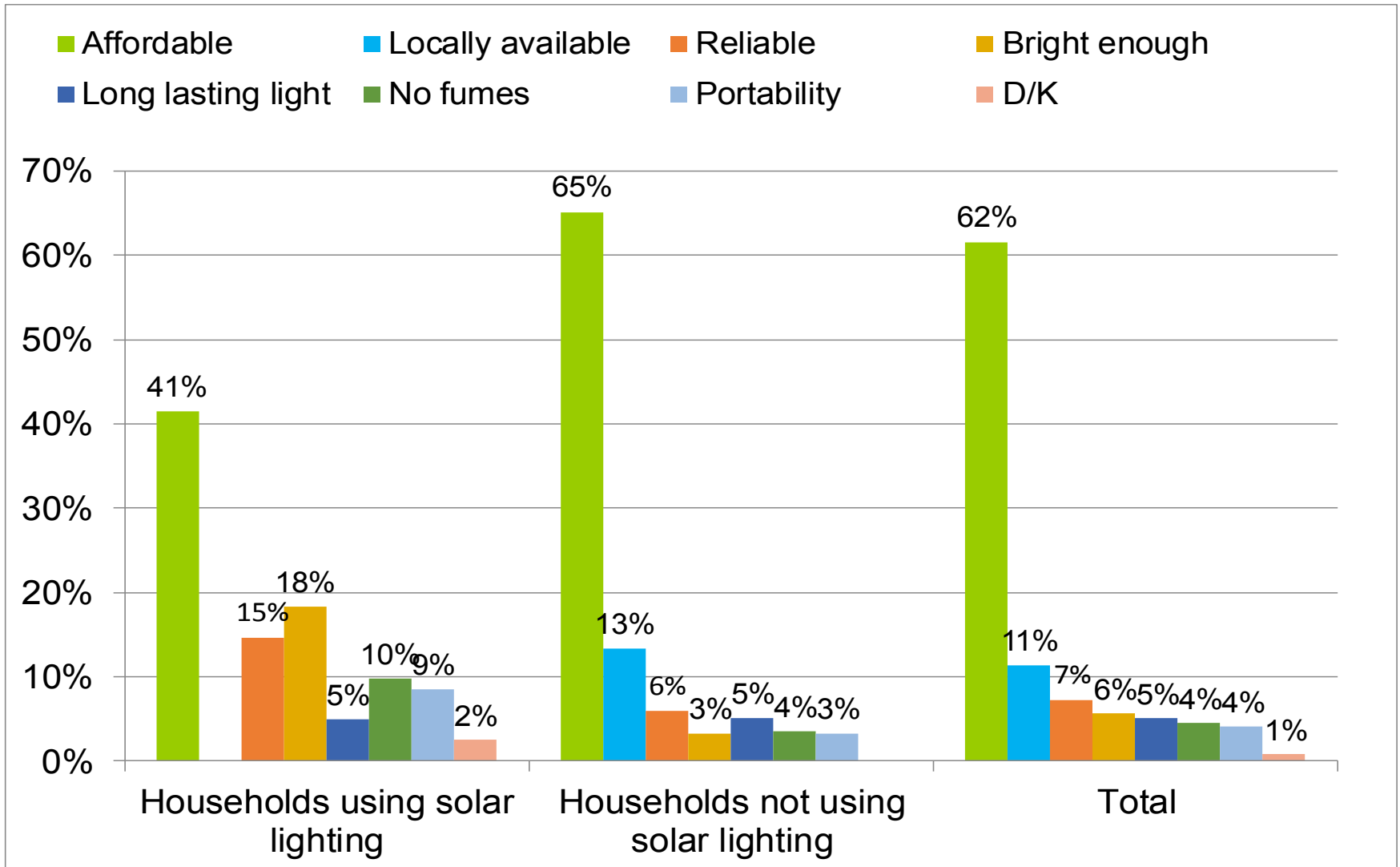
Average number of hours per day main lighting source is used



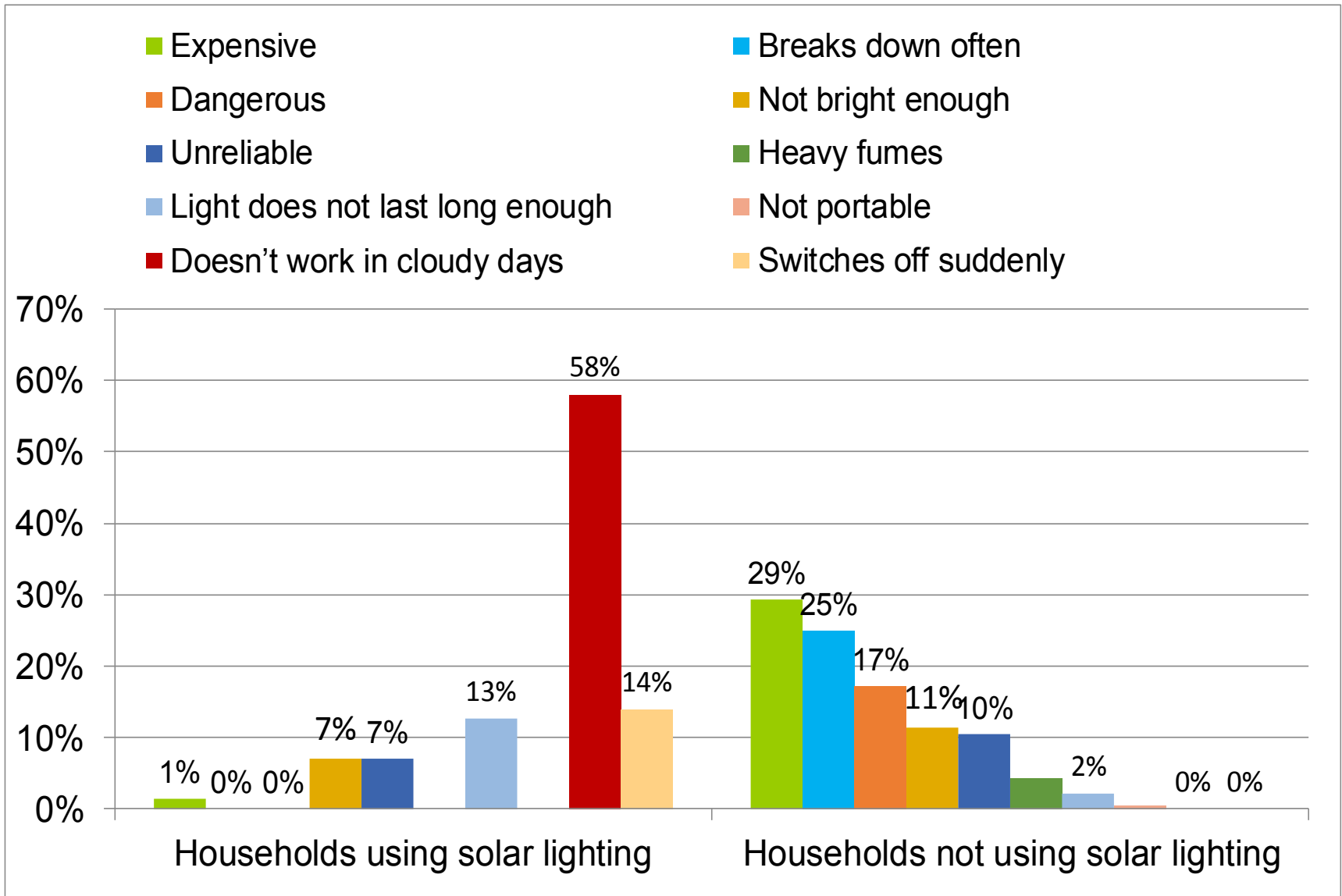
Lighting Source	Average number of hours
PSP	7.3
Torches	7.3
SHS	6.3
Candles	3.6
Paraffin	2.8
Biomass	0.6



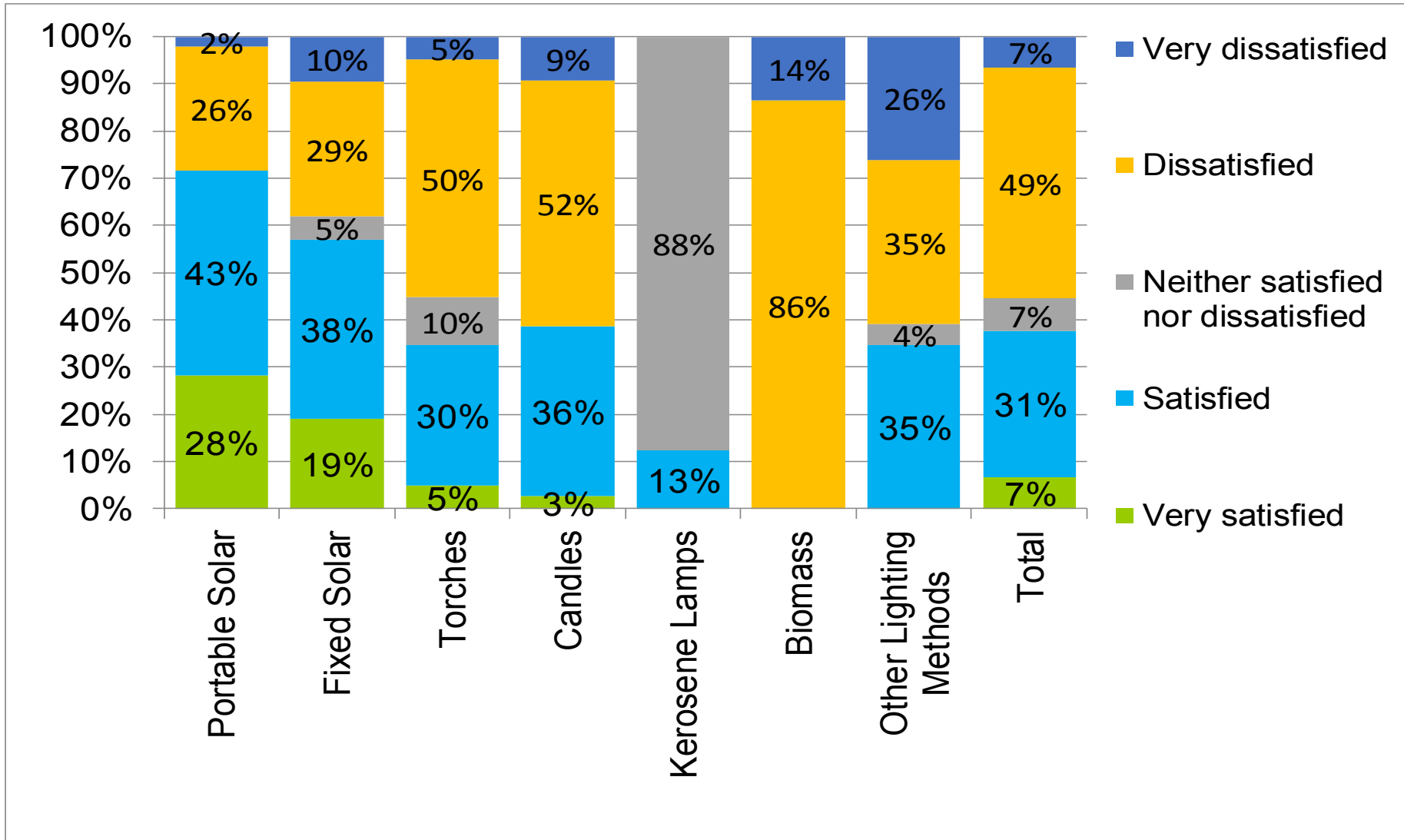
Reasons for choice of main lighting source



Drawbacks of main lighting source



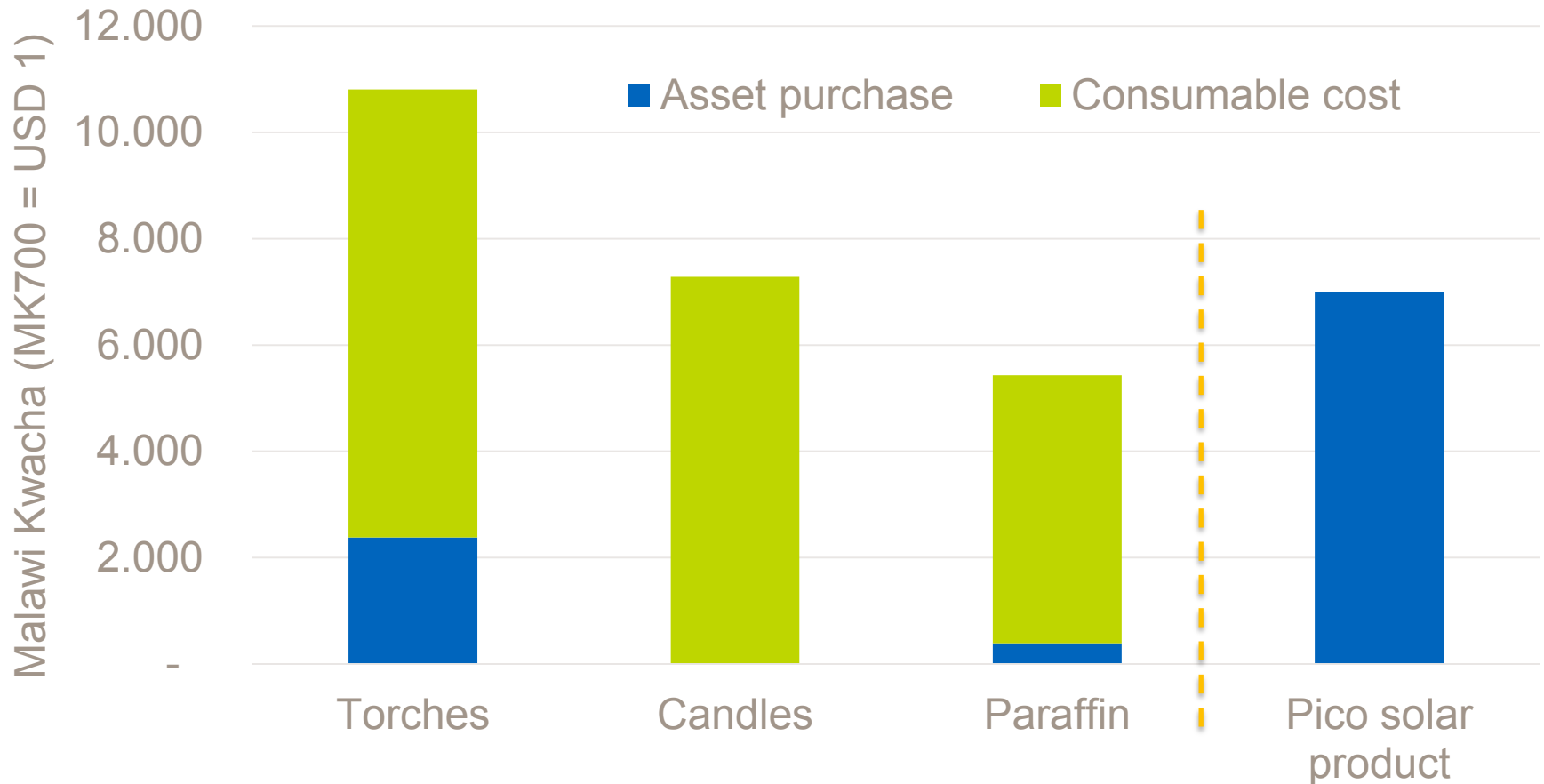
Satisfaction with main lighting source





Lighting Costs & Expenditure

Estimated annual household expenditure on lighting



**PSP
payback
period (\$10)**

8 months

12 months

15 months

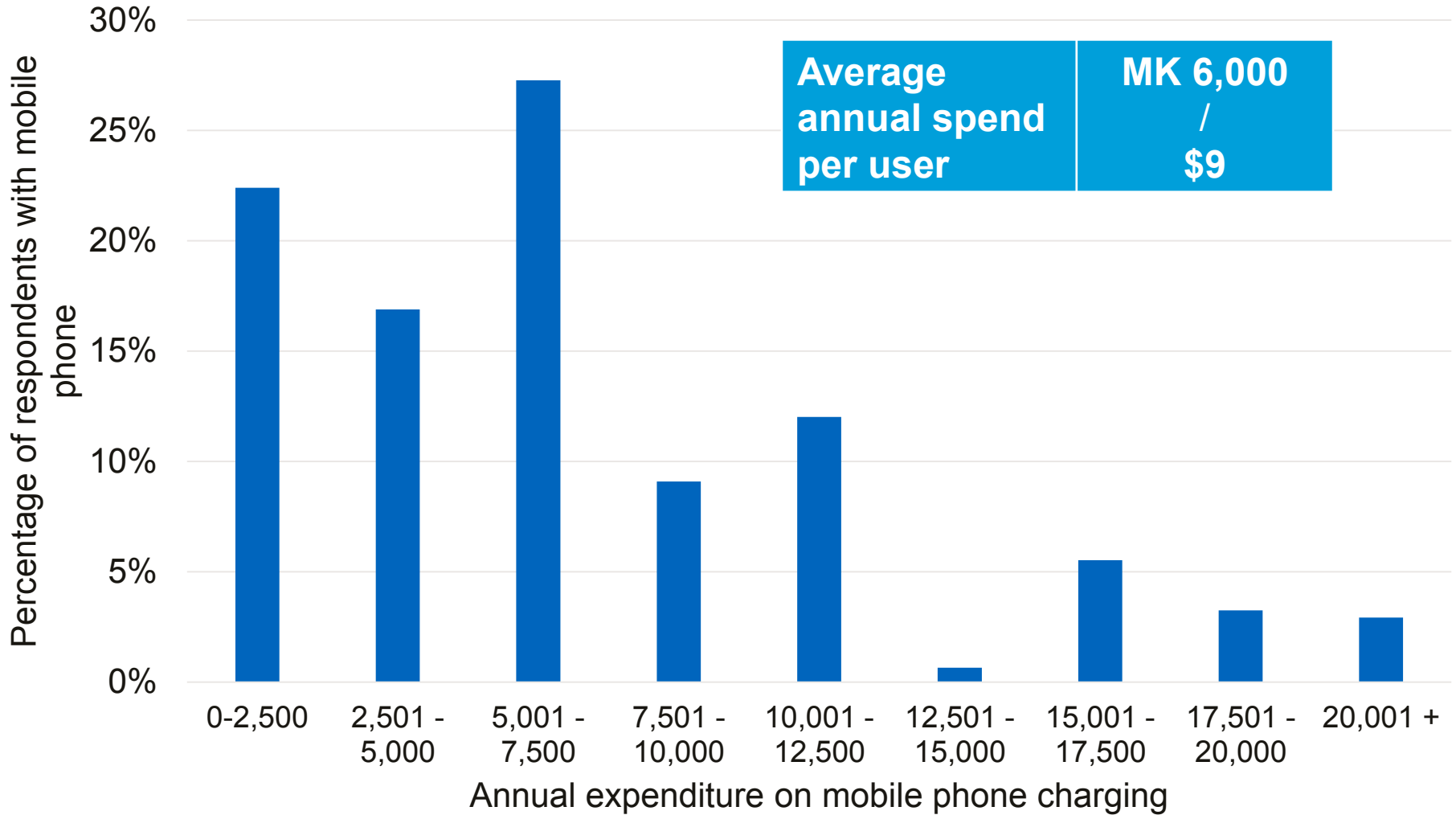
National expenditure on bad quality lighting



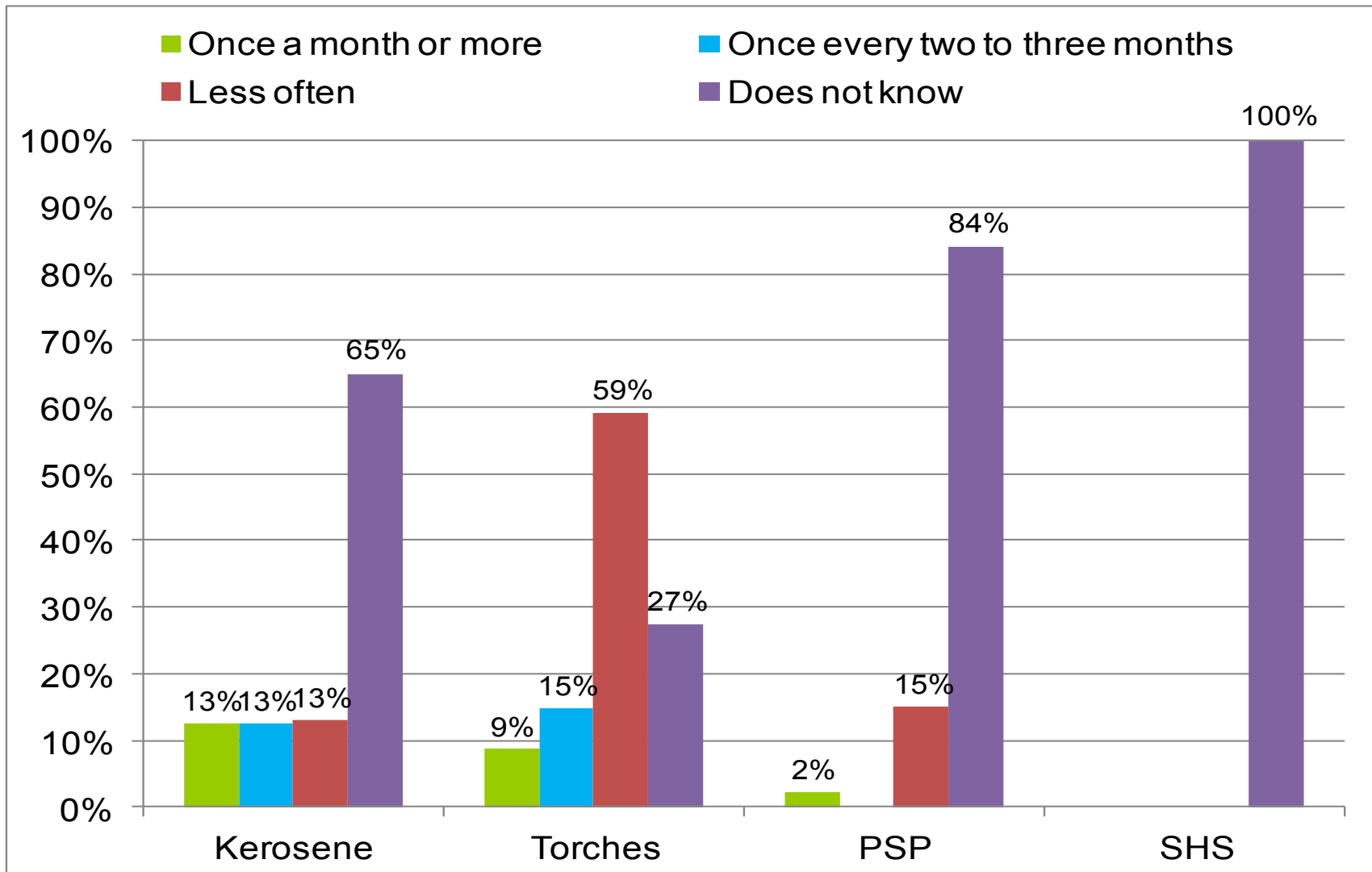
\$50
million

- Malawi spends nearly \$50 million (MK 34 billion) on bad quality and harmful lighting every year.
- Average annual spend per household on lighting = \$14 (MK 10,000).
- The payback period for a pico solar product is 8 months when compared with battery-powered torches.
- Most good quality products come with a 2-year warranty and 5-year expected lifetime

Annual expenditure on mobile phone charging



Frequency of acquisition of main lighting source



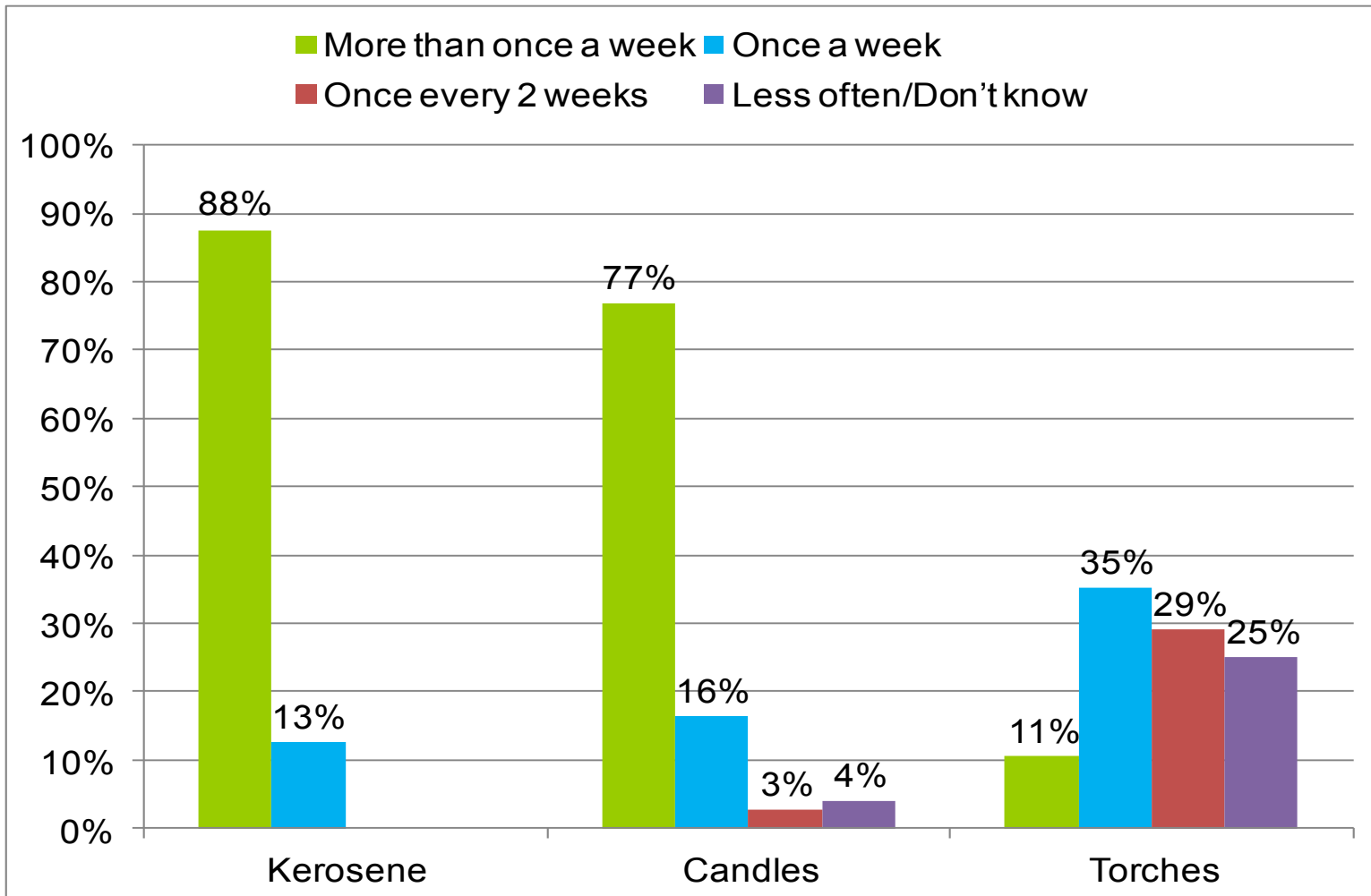


Cost of acquiring lighting sources

Main Lighting Source	Solar Home System	PSP	Torches	Paraffin lamps
Average cost Of Acquisition (Malawi Kwacha)	91,315	9,002	768	106



Frequency of purchasing fuel for main lighting source





Solar lighting awareness
and attitudes

Awareness of solar lighting



92%

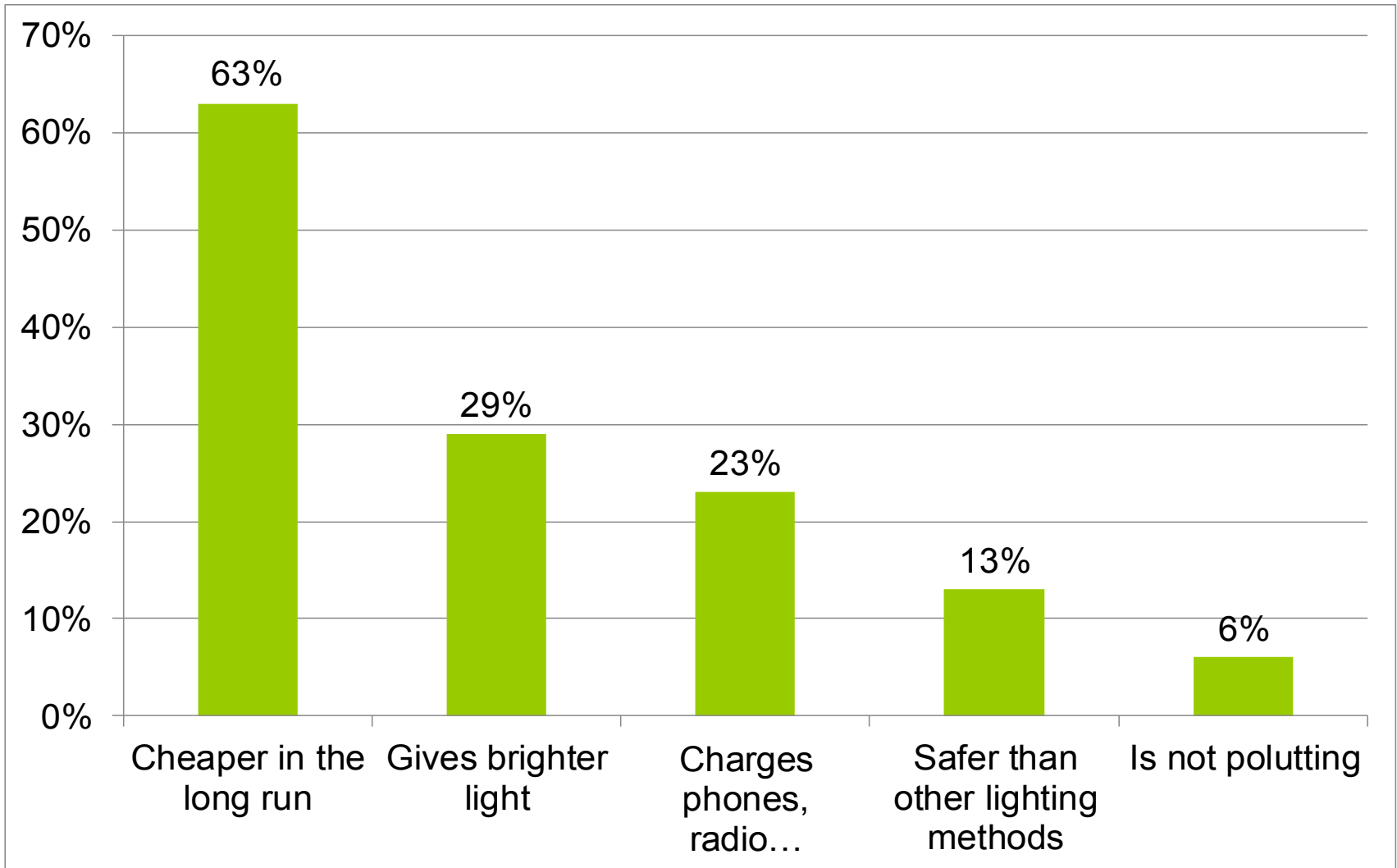
- 92% of off-grid households are aware of using solar lighting.
- Interesting to note that 91% of off-grid households that are not using solar lighting are equally aware of solar lighting



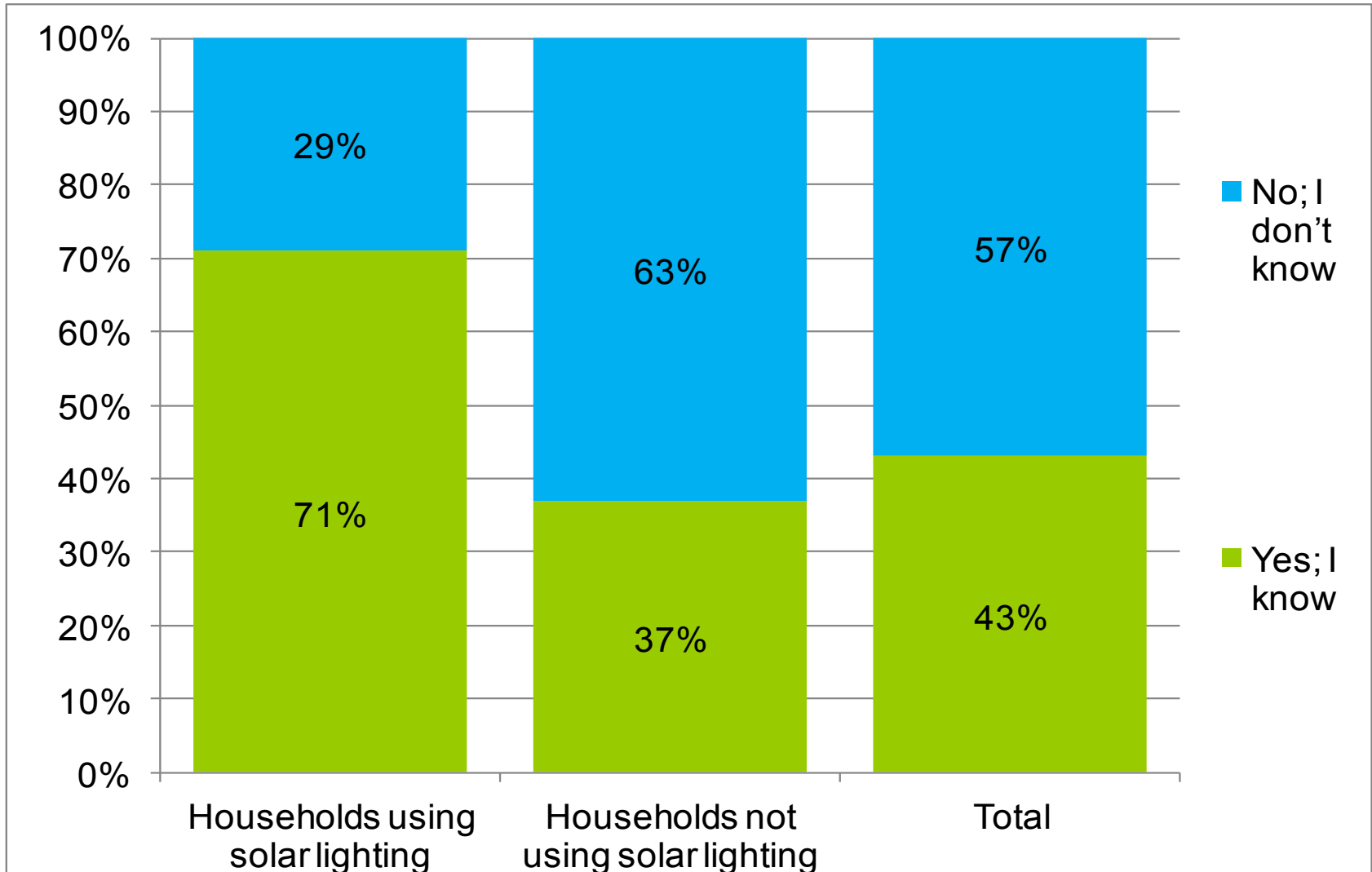
Source of solar lighting awareness

Source of awareness	Households using solar lighting	Households not using solar lighting	Total
Family and friends	94.7%	94.7%	90.4%
Radio	5.3%	21.2%	15.9%
Other source	0.0%	5.8%	5.8%
Road show	0.0%	2.7%	2.7%
School	0.0%	2.0%	2.0%
Vendors/ Shops	0.0%	1.0%	1.0%
Newspaper	0.0%	0.0%	0.0%
TV	0.0%	0.0%	0.0%

Main perceived benefits of solar lighting



Whether knows outlet where can buy solar light





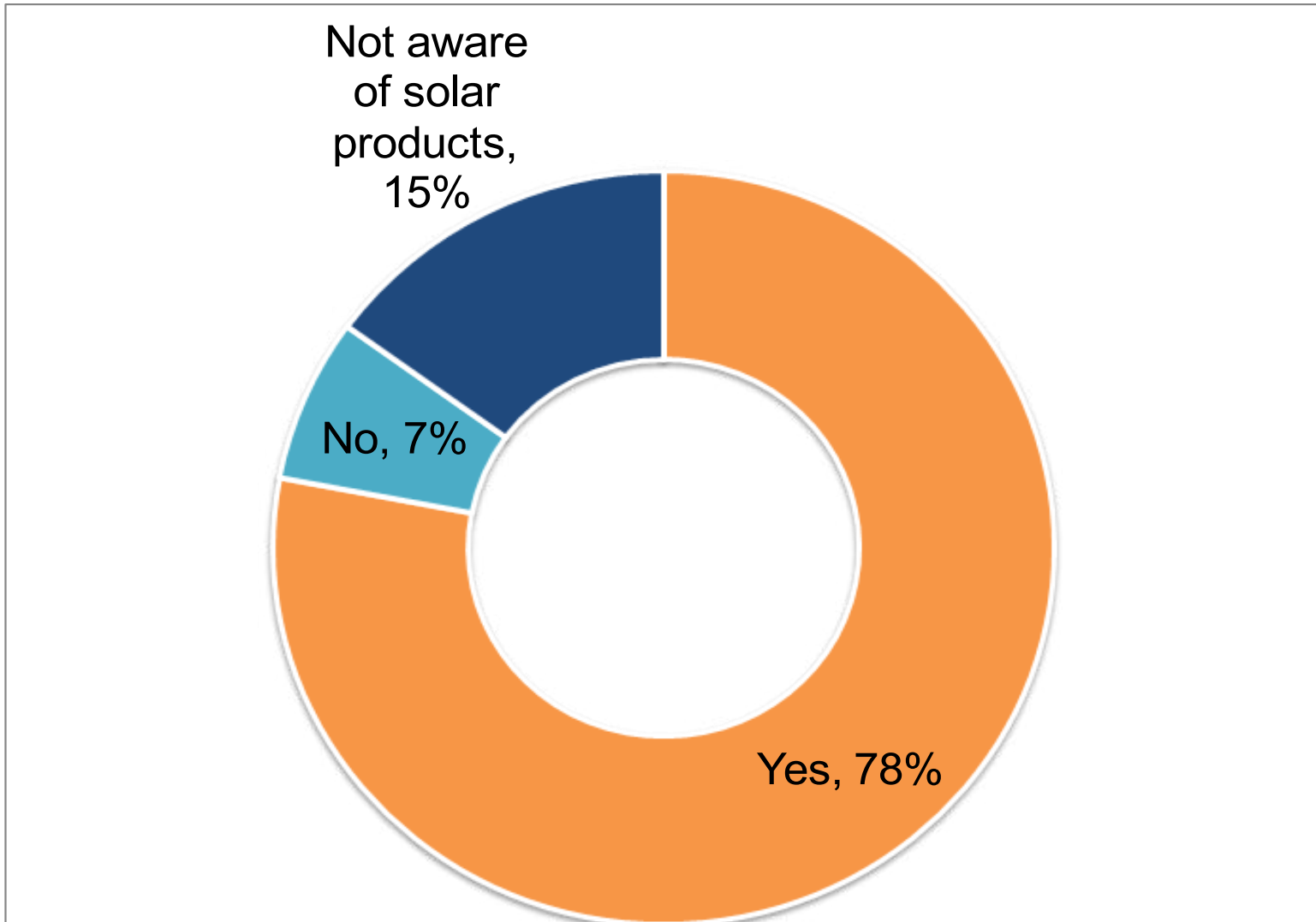
Outlet where can go buy solar light

Location	Households using solar lighting	Households not using solar lighting	Total
Grocery stores	39.1%	21.4%	52.6%
Market	28.3%	17.2%	43.1%
School	10.9%	2.8%	6.9%
Agribusiness stores	0.0%	2.6%	6.4%
Filling station	0.0%	0.2%	0.5%

Average time (minutes) to reach nearest outlet selling solar products

Average time in minutes	Households using solar lighting	Households not using solar lighting	Total
	47.06	58.10	55.33

Whether interested in buying a solar product



Spontaneous perception of solar lighting prices

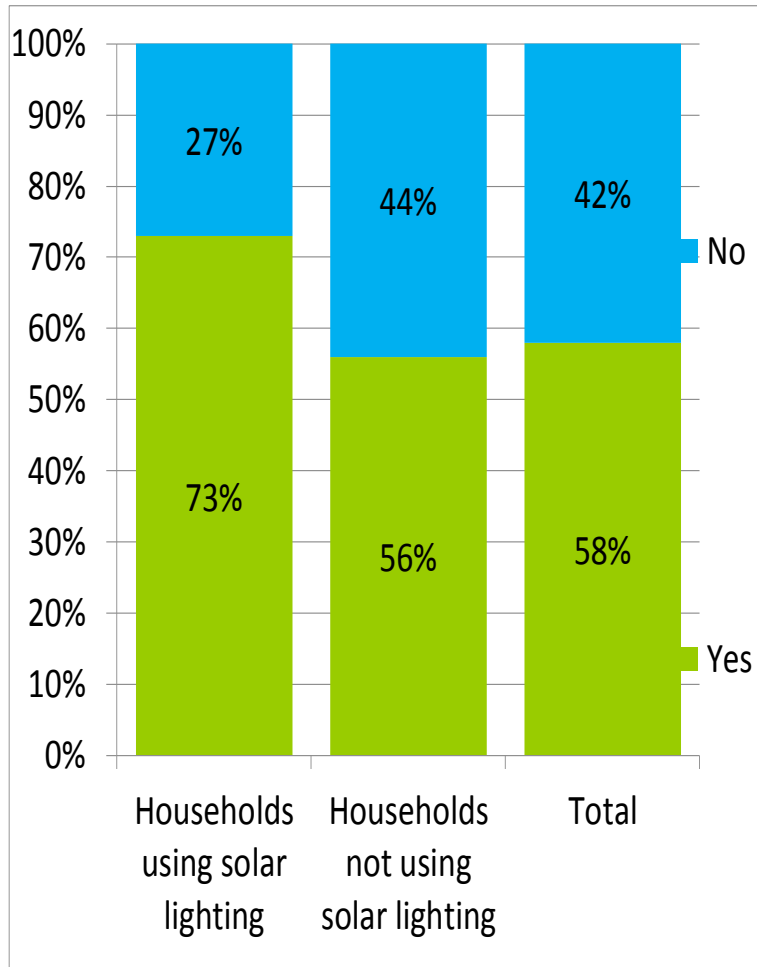


Household profile		Average price estimated a solar light would cost	Amount willing to pay for a solar light
Households using solar lighting	Mean in Malawi Kwacha	52,062	46,000
Households not using solar lighting	Mean in Malawi Kwacha	16,914	9,071
Total	Mean in Malawi Kwacha	21,757	9,370

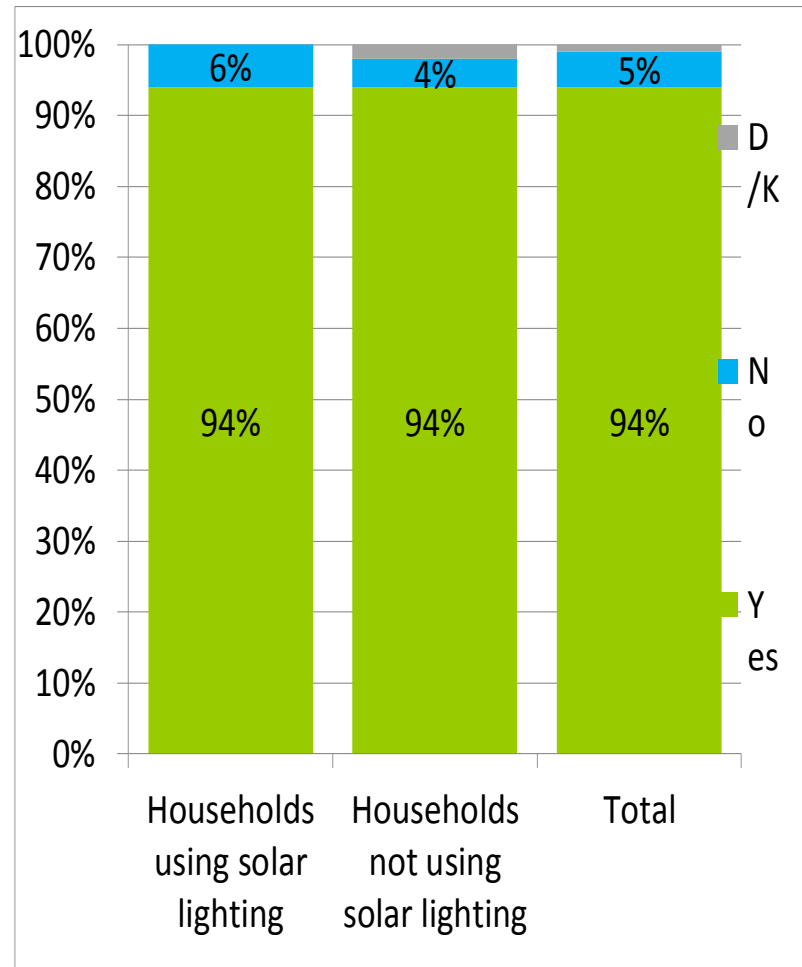
Warranty: Awareness and perceived value



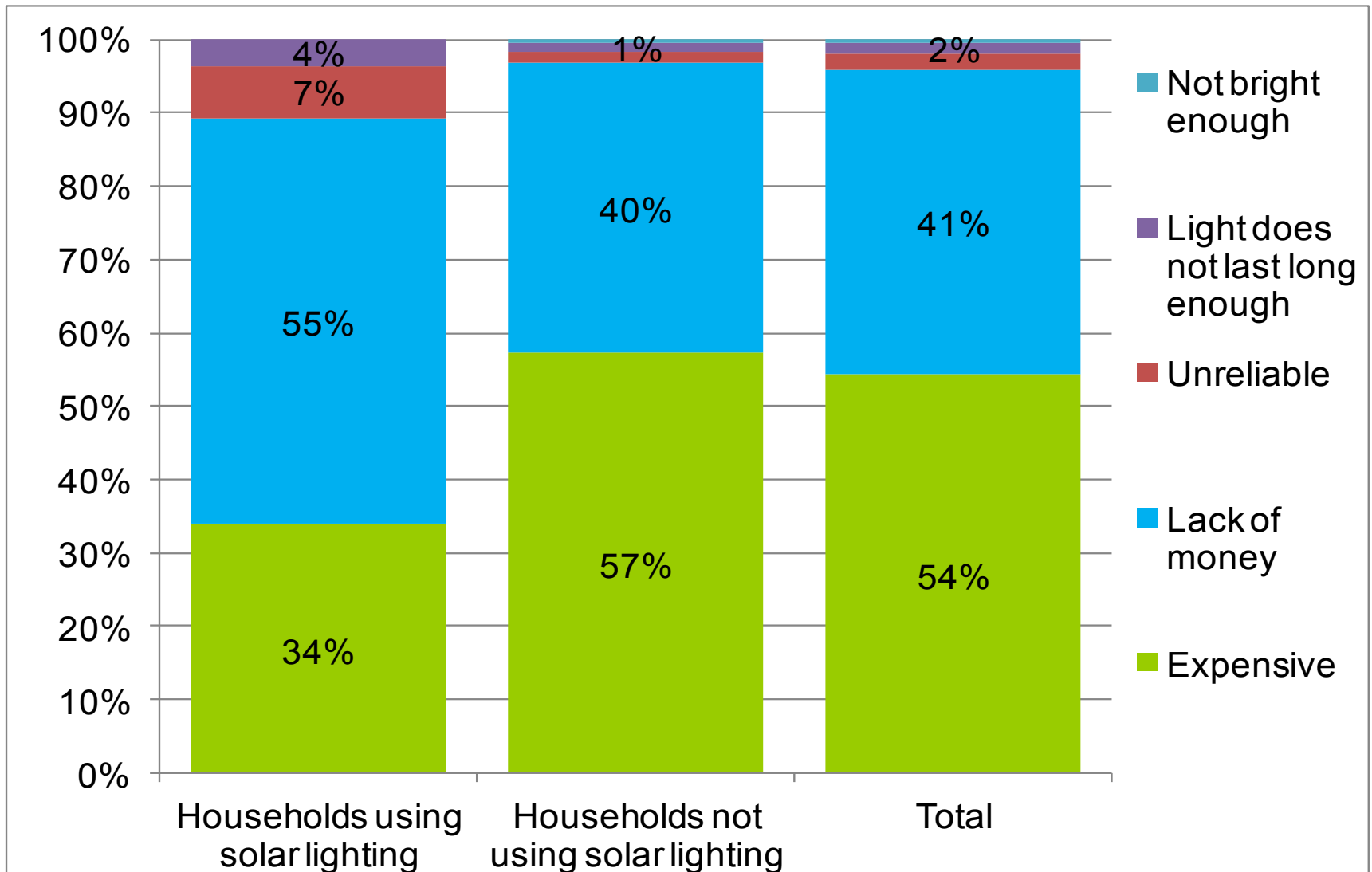
Consumer awareness of product warranty



Consumer willingness to pay more for a product with warranty



Barriers to purchasing solar lights

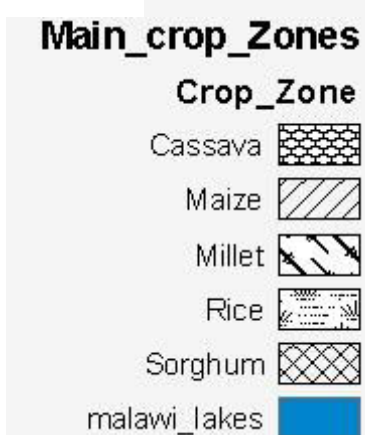
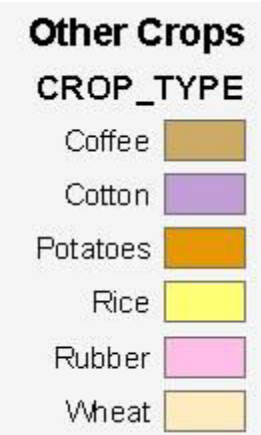
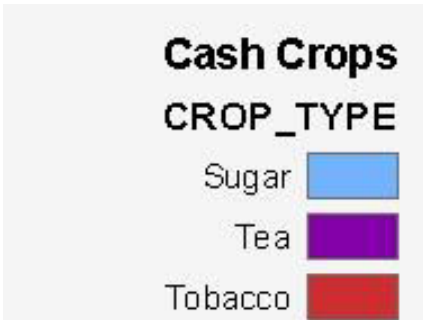
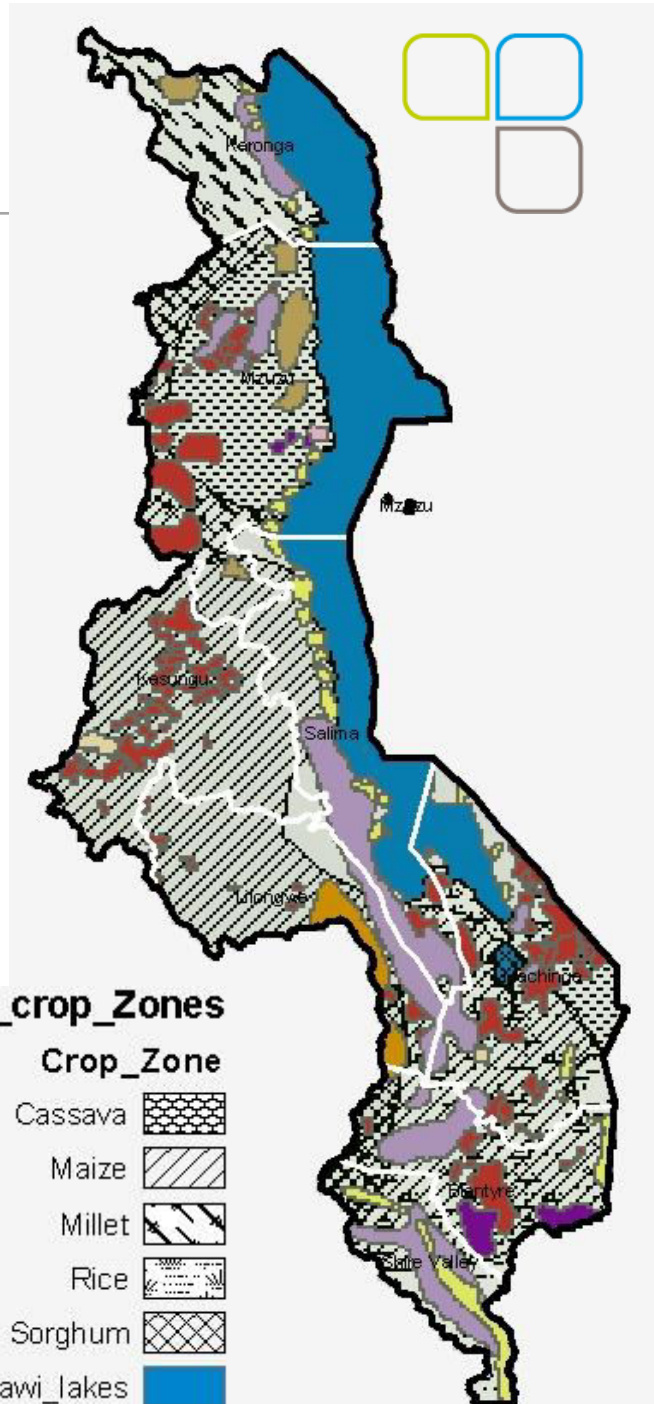




Finding the target market in
Malawi's agricultural economy

Consumer spatial distribution

Value chain	Estimated No. of Smallholder Farmers	Estimated No. of Employees
Coffee	2,513	N/A
Cotton	120,000	4,000
Dairy	17,500	N/A
Sugarcane	3,700	3,925
Tea	11,500	46,792
Tobacco	400,000	5000



Malawi's agricultural calendar and income timing



	Income Timing Calendar											
Value chain type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cotton					■	■	■	■	■			
					■	■	■	■	■	■	■	
Sugarcane				■	■	■	■	■	■	■	■	■
					■	■	■	■	■	■	■	■
Dairy	■	■	■	■	■	■	■	■	■	■	■	■
Tobacco				■	■	■	■	■	■	■	■	
				■	■	■	■	■	■	■	■	
Tea	■	■	■	■								
	■	■	■	■								
Coffee	■	■										■

Key

■ Smallholder farmers ■ Seasonal workers

Closing slide: Disclaimer



This document is an output from a project funded by the UK Department for International Development (DFID). However, the views expressed and information contained in it are not necessarily those of or endorsed by DFID who can accept no responsibility for such views or information or for any reliance placed on them.

The Business Innovation Facility (BIF) is a project funded by the UK Department for International Development (DFID). It is managed for DFID by PricewaterhouseCoopers LLP in collaboration with Imani Development, Intellectap, HamsaHub limited and The Convention on Business Integrity

This publication has been prepared for general guidance on matters of interest only, and does not constitute professional advice. You should not act upon the information contained in this publication without obtaining specific professional advice. No representation or warranty (express or implied) is given as to the accuracy or completeness of the information contained in this publication, and, to the extent permitted by law, PricewaterhouseCoopers LLP and the other entities managing BIF (as listed above) do not accept or assume any liability, responsibility or duty of care for any consequences of you or anyone else acting, or refraining to act, in reliance on the information contained in this publication or for any decision based on it. The views presented in this publication are those of the author(s) and do not necessarily represent the views of BIF, its managers, funders or project partners.