PILOT CIRCULAR ECONOMY CASE STUDY ANALYSIS – DOMICILIARY EQUIPMENT SERVICES

A Report to Green Industries SA

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ABBREVIATIONS

AT	assistive technology
CoS	Continuity of Support
DES	Domiciliary Equipment Service
DHS	Department of Human Services
GISA	Green Industries SA
NACA	National Aged Care Alliance
NDIS	National Disability Insurance Scheme
SA	South Australia

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EXECUTIVE SUMMARY

Green Industries SA (GISA) is a South Australian government statutory authority that helps develop the green economy. As part of this remit GISA is promoting the development of a more circular economy in South Australia. GISA is developing case studies using South Australian examples of applied circular economy thinking. More specifically, GISA is seeking assistance to identify suitable metrics which will tell the story (i.e. appropriate and accessible) and will help track progress (i.e. measurable and consistent) at the company level. This study applies a set of circular economy indicators to a pilot case study organisation.

The case study organisation, the Domiciliary Equipment Service (DES), is a business unit of the South Australian government Department of Human Services (DHS) and provides assistive technology (AT) that allow people to maintain their independence and safety in the community. The DES business model differs from standard government delivery of programs model by loaning equipment to clients, taking back equipment when no longer needed and refurbishing them where possible. The standard equipment supply model, sources and supplies equipment to clients who are responsible for their ongoing care, maintenance and disposal.

GISA approached DES to be a case study to demonstrate an example of an organisation applying circular economy thinking. From a circular economy perspective, this case study demonstrates using resources efficiently and avoiding unnecessary waste by maintaining AT equipment in use for as long as is safely possible. This is enabled by a service model rather than a product supply model. The motivation for this model by DES is to lower costs, shorten equipment supply times and to be more environmentally sustainable.

This study analysed the performance of the DES service model against a standard government delivery of programs model, using a number of circular economy indicators, namely:

1. Relative life of equipment
2. Relative intensity of use of equipment
3. End of use fate of equipment materials
4. Lifecycle cost to deliver AT.

With regard to the functionality and longevity of goods and services aspects of a circular economy business model, the average life of a piece of equipment was estimated to be 5.0 years under the DES service model compared with 2.7 years under the standard equipment supply model, meaning that equipment is used for 86 per cent more time under the DES service model compared to the standard equipment supply model. Likewise, the estimated average number of uses per piece of equipment was estimated to be 8.1 uses under the DES service model and 1.1 uses under the standard equipment supply model, meaning that under the DES service model the same bundle of equipment is used by 7 times as many clients. With the same equipment purchase budget and equipment pool, DES is able to get more utility out of equipment using Government funding more effectively and, importantly, servicing twice as many clients[1].

[1] Servicing an estimated 3,824 clients per year under the DES service model compared with 1,868 clients per year under the standard equipment supply model.

With regard to the materiality of goods and services, end of use fate of equipment materials was analysed by estimating the proportion of equipment reused, recycled and unrecovered (i.e. sent to landfill) at the end of their use. The end of use fate of equipment was estimated to be:

- DES service model: 38 per cent to landfill, 38 per cent to recycling and 24 per cent to reuse
- Standard equipment supply model: 55 per cent to landfill, 37 per cent to recycling and 9 per cent to reuse.

These results demonstrate that the DES business model diverts a significant amount of material from landfill to reuse. This is consistent with the DES aim to maximise the useful life of equipment and components and maintain their value through reuse.

With regard to indicators of broader economic, environmental and social benefit, the lifecycle cost indicator was assessed. This was estimated as the sum of investment[2], operating and social[3] costs net of social benefits[4] discounted to a present value. For the same equipment budget, the DES service model delivered approximately $0.7 million annually in net benefits. Relative to the standard equipment supply model, increased costs of equipment refurbishment and facility operating costs (approximately $1.7 million) were offset by approximately $2.4 million in benefits from avoided welfare costs to clients (from reduced equipment supply times) and better use of clinician resources. This net benefit was achieved whilst servicing twice as many clients.

The analysis included three client example analyses which were representative of the DES customer groups funded by the SA Government. They covered:

- Client with changing needs over a long period
- Client using the palliative care system
- Client with needs that are stable.

The palliative care client example analysis produced the best results in terms of the circular economy indicators assessed, whilst the long-term, stable needs client example produced the most modest results. However, it should be noted that for all the circular economy indicators across all the client examples the results were more positive than the equivalent examples under the standard equipment supply model.

Palliative care clients have short-term needs for a number of AT equipment. In this situation, with the standard equipment supply model there is significant potential for 'wastage' of equipment and the DES service model, where equipment can be efficiently recovered, refurbished and returned to use, is a much more efficient business model. This is much less the case with clients with long-term, stable AT equipment needs, where equipment is more likely to be used fully over the equipment's effective life. However, the DES service model still provides benefits by reducing costs, reducing wastage of equipment and clinician resources and reducing equipment supply times.

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2 Equipment purchase and refurbishment.
3 Equipment delivery time impacts on clients.
4 Better use of clinician resources.

1. INTRODUCTION

1.1. Background

Green Industries SA (GISA) is a South Australian government statutory authority that helps develop the green economy in response to the demand for clean and green produce, and the reduction of emissions to air, water and soil from industry. GISA promotes the circular economy, resource efficiency and the conservation and recovery of scarce resources[5].

As part of this remit GISA is promoting the development of a more circular economy in South Australia (SA). Among other related activities, GISA is developing case studies using South Australian examples of applied circular economy thinking. More specifically, GISA is seeking assistance to identify suitable metrics which will tell the story (i.e. appropriate and accessible) and will help track progress (i.e. measurable and consistent) at the company level.

GISA has engaged BDO EconSearch to:

1. Provide written advice to GISA relating to indicator and metric choice for use in circular economy case studies in SA
2. Application of 1 above to the development of a pilot circular economy case study.

This paper responds to the second requirement.

1.2. The Case Study Organisation

The Domiciliary Equipment Service (DES) is a business unit of the South Australian government Department of Human Services (DHS). DES provides assistive technology (AT). Services include the supply of a full range of equipment and home modifications, as well as repair services that allow people to maintain their independence and safety in the community.

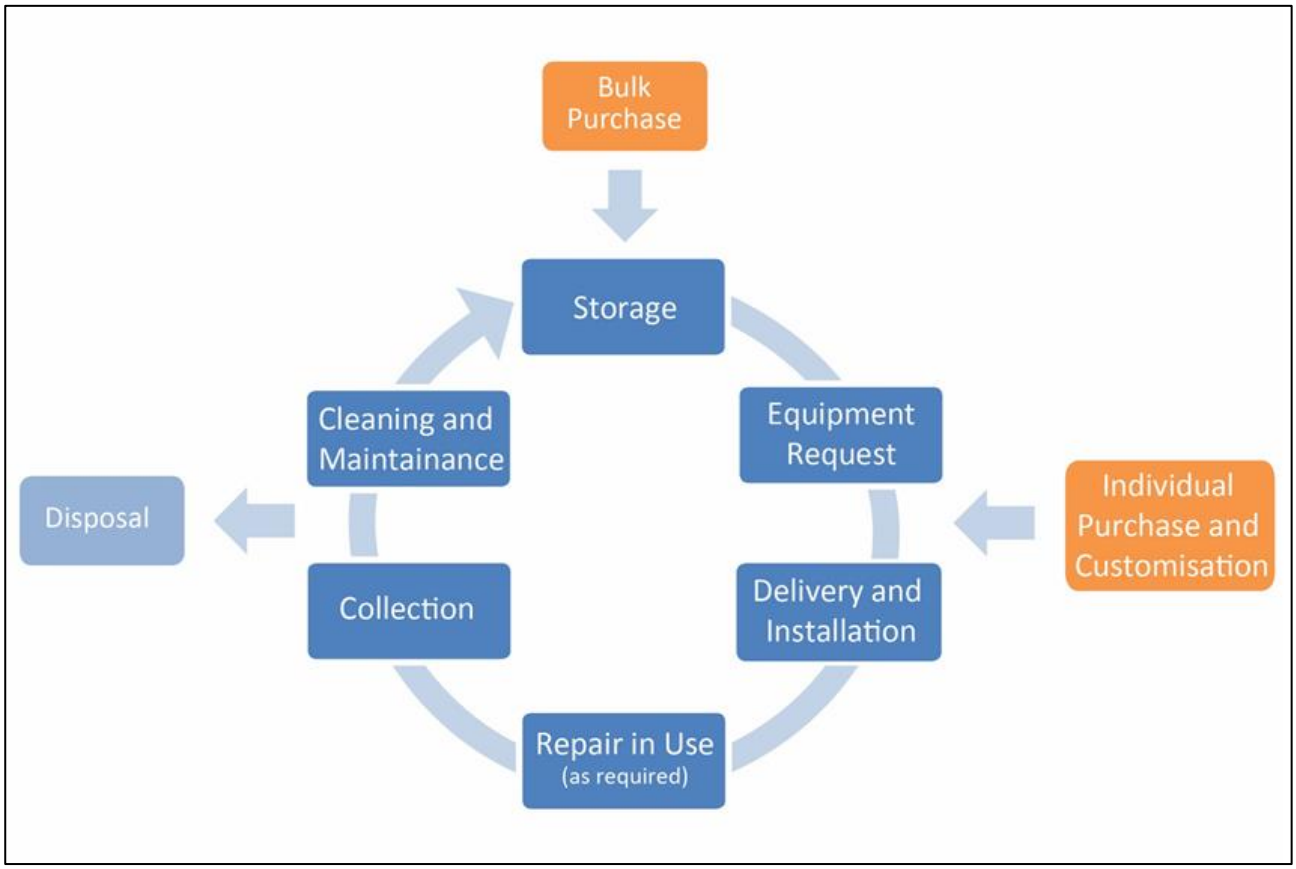
DES currently manages the AT needs of more than 15,000 people in South Australia. Clients include people eligible for the DHS Equipment Program, the National Disability Insurance Scheme (NDIS), the Lifetime Support Scheme, hospitals, community care agencies, as well as individuals privately hiring equipment.

DES maintains over 400 types of equipment in stock, available for rapid dispatch to clients as required. These items are typically 'on loan' and as part of the package DES provides delivery and installation, training of clients in safe use of equipment, equipment repairs and replacement as required.

DES refurbishes readily available items from a single pool of equipment to lower costs, shorten equipment supply times and to be more environmentally sustainable. The equipment supply cycle is described in Figure 1-1.

5 https://www.greenindustries.sa.gov.au/

Figure 1-1 Equipment supply cycle, DES



Source: DES.

The DES business model differs from standard government delivery of programs model. The DES service model loans equipment to clients, taking back equipment when no longer needed and refurbishing them where possible. The standard equipment supply model sources and supplies equipment to clients who are responsible for their ongoing care, maintenance and disposal. Details of both models are further described in Table 2-1.

1.3. Scope of Study

The study analysed DES programs that the SA government will retain funding and policy responsibility for post NDIS and Ageing reforms. Analysis was based on 2017/18 DES data, assuming static client numbers (i.e. demand) and client needs. The analysis included three client example analyses and an organisational level analysis. The client examples were representative of the DES customer groups funded by the SA Government.

The client examples were:

- Client with changing needs over a long period
- Client using the palliative care system

- Client with needs that are stable.

The organisational level and client example analyses were compared against a standard government delivery of programs model. The standard equipment supply model was based on Disability SA model prior to transfer to DES (described in more detail in Table 2-1).

1.4. Report Structure

The remainder of the report is structured in six parts:

Section 2 – Method of analysis

Sections 3 to 5 – Client example analysis

Section 6 – Organisational level analysis

Section 7 – Discussion.

2. METHOD OF ANALYSIS

The organisational level and client example analyses were compared against a standard Government delivery of programs model (Base Case). The standard equipment supply model was based on Disability SA model prior to transfer to DES. The two business models are described in Table 2-1.

Table 2-1 Alternative scenarios for the analysis

Scenario	Description
Base Case	Clinician works with client to identify an equipment product that will meet a specific need. Clinician will research all items from a network of suppliers. Supplier provides a quote for the item and the clinician then supplies that along with a clinical prescription to the funder. Once approved by the funder (or client), the supplier then sources the new item and delivers and installs it once stock becomes available. If modifications are required these are sourced and quoted on a case by case basis. The client is responsible for individual repair arrangements with each supplier. Funders will then need to approve repairs for specific equipment items.
DES service model	Clinician works with client to identify an equipment item from a range of approximately 400, readily available items to meet a specific need. These items are normally pre-approved, by the funder, for supply to their client. Readily available items may be supplied refurbished or new (same loan price). With the pre-approval from the funder, DES will deliver and install the item from existing stock. In the case of a readily available item not meeting a specific need, DES may quote for the supply of a piece of equipment purchased specifically for that need. Once approved, this is then sourced, delivered and installed. If modifications are required these are sourced and quoted on a case by case basis. The client will contact DES to arrange all repair services for their equipment. Repairs are included in the loan costs.

2.1. Circular Economy Indicators Assessed

As part of this study an initial list of circular economy indicators, across four circular economy descriptors, was developed for product/service and organisational level analysis (see Appendix 1 and EconSearch 2018). From that list, the following indicators were analysed:

Descriptor 1: Increased functionality and/or longevity of goods/services

1. Relative life
2. Relative intensity of use

Descriptor 2: Decreased materiality of goods/services

3. End of use fate of equipment materials

Descriptor 3: Decreased dependence on use of GHG causing fossil fuels

Indicators not assessed, not within scope.

Descriptor 4: Indicators of broader economic, environmental and social benefit

4. Lifecycle cost.

Each of these indicators are described in more detail in Table 2-2.

Table 2-2 Circular economy indicators used in assessment

Indicator	Description
Relative life of equipment	Calculated as the average life of the bundle of equipment supplied under the DES service model divided by the average life of the bundle of equipment supplied under the standard equipment supply model.
Relative intensity of use of equipment	Calculated as the average number of uses[6] during the bundle of equipment's' life under the DES service model divided by the average number of uses during the bundle of equipment's' life under the standard equipment supply model.
End of use fate of equipment materials	Calculated as the proportion of equipment reused, recycled and unrecovered (i.e. sent to landfill) at the end of their use. Compared with the standard equipment supply model.
Lifecycle cost to deliver AT	Calculated as sum of investment (equipment purchase and refurbishment), operating and social (i.e. equipment delivery time impacts on client) costs net of social benefits (i.e. better use of clinician resources) discounted to a present value. Compared with the standard equipment supply model.

2.2. Client example analyses - data and assumptions

DES service model

DES provided, for each of the equipment items, the following data:

- Average supply time (days)
- Average life (years) – based on age at write-off
- Purchase price

[6] Where one use is the equivalent of one prescription (and consequent use) of one piece of equipment by one client.

- Refurbishment cost per issue
- Fate of equipment at write-off, namely disposal (to landfill or recycling), sale or gift, lost or stolen and spare parts.

These data were extracted from the DES equipment tracking data base.

Items were assumed to be new at time of issue, to be comparable with the standard equipment supply model (Base Case).

End of use fate of equipment materials

For items with a life less than the length of use, it was assumed that they were replaced when they reached their safe life period. For items with a safe life equal to the length of use, it was assumed that they were written-off and disposed of. For items with a safe life greater than the length of use at the time of end of use, it was assumed they were returned and refurbished for reuse.

Regarding the fate of equipment items, the following were assumed:

- Disposal –50 per cent to landfill and 50 per cent to recycling
- Sale or gift – 100 per cent reuse
- Lost or stolen – 100 per cent landfill
- Spare parts – 100 per cent reuse.

Lifecycle costs

The following costs and savings were analysed:

Costs

- Equipment purchase
- Equipment refurbishment
- Supply time costs to client wellbeing

Savings

- Clinician time released.

These costs and savings were identified from Massey-Westropp (2010) and discussions with DES.

Equipment purchase: Equipment purchase cost was annualised over the safe life of the equipment item.

Equipment refurbishment: Equipment refurbishment costs were applied at the end of use period for items that had not reached the end of their safe life.

Supply time costs to client wellbeing: The supply time was applied at issue and reissue, where applicable. Items were assumed to be supplied in batches, i.e. initial request items were supplied at the same time, and so forth. The item with the longest supply time from a batch was taken to be the period during which

the client was without appropriate equipment. Based on NACA (2018)[7], it was assumed that the impact was equivalent of:

- 2 hours per week of formal care (i.e. whilst the client was without the needed equipment, the client would need this additional care to achieve the same level of activity) at $50/hr; plus
- 13 hours per week of informal care at $13.60/hr.

This cost was estimated to be $39.54/day without appropriate equipment.

Clinician time released: With a streamlined equipment ordering and supply process which reduces the time clinicians spend researching and managing the equipment ordering and supply process, DES estimated the likely clinician time released to be 6fte on the basis of their output being 100 prescriptions per week (Massey-Westropp 2010). The clinician cost per hour was based on the average between an allied health professional (at $180/hr, NACA 2018) and an allied health assistant or AT supporter (at $80/hr, NACA 2018). On this basis, a clinician cost saving per prescription of $198 was estimated. Each item was assumed to be a prescription. This was applied to each equipment item issue or reissue to estimate the clinician cost savings.

Base Case (standard equipment supply model)

Items were assumed to be new on purchase, and were assumed to be granted to the client.

End of use fate of equipment materials

At the end of use, items with a purchase price under $300 were assumed to be disposed of, and items with a purchase price above $300, were assumed to be sold or gifted, unless they were near their end of safe life. Disposal items were assumed to be disposed of to landfill or recycling at a ratio of 60:40, respectively. Sold or gifted items were allocated 100 per cent to reuse.

Lifecycle cost

The following costs were analysed:

Costs

- Equipment purchase
- Supply time costs to client wellbeing.

Equipment purchase cost was annualised over the use period of the equipment item, i.e. it was assumed that the use period equalled the life of the item of equipment.

The same approach towards estimating the supply time impacts on client welfare was applied. For items with a supply time under the DES service model of 5 days or less it was assumed they were delivered in 5 days under the Base Case. For items with a delivery time greater than 5 days, an additional 80 per cent was

[7] The National Aged Care Alliance (NACA) put out a position paper on assistive technology for older Australians. Included in this paper was an economic analysis of assistive technology, from which this current study draws data and assumptions.

added to the time to deliver under the Base Case. This assumption was based on analysis comparing delivery times under the two models in Massey-Westropp (2010).

2.3. Organisation level analysis – data and assumptions

DES service model

The client examples used for the client example analyses were representative of the customer groups for which the SA Government will retain funding and policy responsibility post NDIS and Aged Care reforms which was the scope of the organisational level analysis (see Section 1.3). The client examples were used as the basis for aggregating the data from the client example analysis to the organisation level analysis.

DES provided the following information regarding customer groups and client numbers for the analysis (Table 2-3), which were used to aggregate the data from the client example analysis to the organisation level analysis.

Table 2-3 DES customer groups and client numbers used in the analysis

Customer group	Description	Client numbers[a]
DHS Disability >65 years of age	People within the Continuity of Support Programme (CoS) People with a disability, not within CoS but with complex equipment, home modification or wheelchair and seating service needs	1,070
DHS: Palliative	People accessing community palliative care services in metropolitan Adelaide	1,000
DHS: Other Ageing	People accessing other State funded programs previously provided by Domiciliary Care	1,754

a Client numbers as at 16/1/2019 for 'disability older than 65 years of age' cohort and 'other aging' cohort. Palliative care cohort based on estimated client numbers for 2017/18.

Source DES.

Relative life and relative intensity of use indicators

The indicators were estimated as the weighted average by client numbers of these indicators for the three client example analyses.

End of use fate of equipment materials

The analysis used data provided by DES on fate of equipment at write-off. The indicators were estimated as the weighted average by client numbers of the three client example analyses.

Lifecycle costs

As described above, the equipment purchase costs for the individual client analyses were aggregated to the organisational level using the client numbers for each customer group. DES provided an estimate for the Equipment Program Budget of $3.4 million for 2019/20 (Table 2-4). The aggregated equipment purchase

costs were adjusted to the Equipment Program budget using an adjustment factor of 0.82. This adjustment factor was applied to the aggregated cost and savings estimates derived from the client example analyses.

An addition to the lifecycle costs assessed in the client example analyses, facility operating costs were included in the organisational level analysis. These facility operating costs included building, business and staff overhead and incidental costs, but excluded equipment refurbishment costs and equipment purchase costs. Based on actual operating costs provided by DES, these facility operating costs were estimated to be $1.1 million.

Table 2-4 DHS Equipment Program indicative budget, 2019-20[a]

Customer group	Budget ($ million)
DHS Disability >65 years of age	1.7
DHS: Palliative	1.4
DHS: Other Ageing	0.3
Total	**3.4**

[a] Excludes any clinical assessment allocations.

Base Case (standard equipment supply model)

The Base Case equipment costs per client estimated in the individual client analyses for each customer group were applied to the Equipment Program budget (Table 2-4) to estimate the client numbers by customer group for the Base Case.

Lifecycle costs

These client numbers were applied to the cost and savings estimates derived from the client example analyses.

It was assumed that there was no facility operated, and therefore no facility operating costs were applied.

Relative life and relative intensity of use indicators

The indicators were estimated as the weighted average by client numbers of these indicators for the three client example analyses.

End of use fate of equipment materials

For equipment that was assumed to be disposed of at the end of the client use in the individual client analyses, it was assumed that the equipment fate, as per the individual analyses, was 60 per cent to landfill and 40 per cent to recycling. For equipment that was assumed to be reused at the end of the client use (i.e. gifted/sold to another user) in the individual client analyses, the DES data on disposal fate at write-off was applied. The indicators were estimated as the weighted average by client numbers of the three client example analyses.

3. CLIENT EXAMPLE 1 ANALYSIS

3.1. Description

The first client example is an adult client diagnosed with a degenerative neurological condition. The analysis focusses on the first 10 years where the client's needs change and become more complex. Table 3-1 describes the AT equipment needs of the client over the 10-year period.

Table 3-1 Equipment needs, client example 1

New request timeframe	Reason	Equipment request for issue	Equipment to be returned
Initial request	To increase safety with personal care and mobility	Shower chair	
		Traymobile	
		Walking stick	
		Toilet seat raise	
1 year	Equipment required to assist with community access	Manual wheelchair	Walking stick
		Walking frame	
2 years	Additional equipment due to relapse and deterioration	Mobile shower chair	
		Bedstick	
		Scooter	
		Commode	
		Bed blocks (8)	
2 years, 2 months	Return of item due to improvement in function		Mobile shower chair
3 years	Equipment required for mobility inside the house	Customised manual wheelchair	Manual wheelchair
			Walking frame
		Cushion (Jay Union)	
			Traymobile
4 years	Additional equipment due to relapse and deterioration	Mobile shower chair	Shower chair
		Hoist	Toilet seat raise
		Sling	
5 years		Powered wheelchair	Commode

New request timeframe	Reason	Equipment request for issue	Equipment to be returned
	Further equipment to assist with mobility	Bed	Bedstick
		Basic mattress	Bed blocks
			Scooter
7 years	Equipment to assist with managing pressure case	Alternating pressure mattress	Basic mattress
			Jay union cushion
		ROHO cushion	
10 years	No change	**Ongoing Equipment:**	Customised wheelchair
			Roho cushion
			Alternating pressure mattress
			Hoist
			Sling
			Mobile shower chair
			Bed
			Powered wheelchair

Source: DES.

3.2. Results

3.2.1. Increased functionality and/or longevity of goods/services

Two circular economy indicators were analysed under this category:

- Relative life
- Relative intensity of use.

Relative life is calculated as the average life of the bundle of equipment supplied under the DES service model divided by the average life of the bundle of equipment supplied under the Base Case (standard equipment supply model).

The average life of a piece of equipment in this scenario is 4.2 years under the DES service model and 2.8 years under the Base Case, meaning that equipment is used for 64 per cent more time under the DES service model compared to the Base Case. In other words, the relative life indicator was estimated to be 1.64.

Relative intensity of use is calculated as the average number of uses[8] during the bundle of equipment's life under the DES service model divided by the average number of uses during the bundle of equipment's' life under the Base Case (standard equipment supply model).

The estimated average number of uses per piece of equipment was estimated to be 3.3 uses under the DES service model and 1.1 uses under the Base Case, meaning that under the DES service model the same bundle of equipment is used by almost three times as many clients (i.e. the relative intensity of use indicator was estimated to be 2.91).

3.2.2. Decreased materiality of goods/services

One circular economy indicator was analysed under this category: end of use fate of equipment materials.

End of use fate of equipment materials is calculated as the proportion of equipment reused, recycled and unrecovered (i.e. sent to landfill) at the end of their use under this client example. The DES service model is compared with the Base Case (standard equipment supply model).

The end of use fate of equipment was estimated to be:

- DES service model: 10 per cent to landfill, 10 per cent to recycling and 80 per cent to reuse
- Base Case: 47 per cent to landfill, 32 per cent to recycling and 21 per cent to reuse.

3.2.3. Indicators of broader economic, environmental and social benefit

One circular economy indicator was analysed under this category, namely lifecycle cost.

A discounted cash flow analysis was undertaken to estimate the lifecycle cost indicator, using a discount rate of 6 per cent.

The net benefit of the DES service model relative to the Base Case was estimated to be approximately $2,586 annually in present value terms. Details of the result are provided in Table 3-2.

There were relatively fewer equipment purchase and equipment supply time costs for the DES service model in comparison to the standard equipment supply model. These reduced costs were offset slightly by additional equipment refurbishment costs, giving an estimated annual cost saving of $1,981 under the DES service model relative to the Base Case. An estimated $605 per year in clinician time was saved[9] under the DES service model. Overall these cost savings and additional benefits resulted in an estimated annualised net benefit of $2,586.

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8 Where one use is the equivalent of one prescription (and consequent use) of one piece of equipment by one client.

9 In practice, this time is likely to be redirected away from AT equipment acquisition (not their area of expertise) towards their area of expertise (i.e. clients' needs assessment. In other words, this value represents the avoided cost from poor use of human resources.

Table 3-2 Net benefit results (annualised net present value, $), client example 1[a]

	DES service model	Standard equipment supply model	Net value
Costs			
Equipment purchase	3,409	4,486	-1,077
Equipment refurbishment	107	0	107
Equipment supply time	1,232	2,244	-1,012
Total costs	*4,749*	*6,730*	*-1,981*
Benefits			
Clinician time	605	0	605
Total benefits	*605*	*0*	*605*
Total net benefit ($)	**-4,144**	**-6,730**	**2,586**

[a] In 2018 dollars.

Source: BDO EconSearch analysis.

4. CLIENT EXAMPLE 2 ANALYSIS

4.1. Description

The second client example is an adult with a palliative diagnosis requiring services for 6 months. Table 4-1 describes the AT equipment needs of the client over the 1-year period.

Table 4-1 Equipment needs, client example 2

New request timeframe	Reason	Equipment request for issue	Equipment to be returned
Initial request	To increase safety with personal care and mobility	Shower chair	
		Traymobile	
		Walking frame	
2 months	Equipment required to assist with community access	Manual wheelchair	
4 months	Additional equipment due to deterioration	Commode	
		Absorbent bed sheets	
6 months	Equipment to assist with managing pressure care	Bed	
		Alternating pressure mattress	
7 months	Equipment returned		Shower chair
			Traymobile
			Walking frame
			Alternating pressure mattress
			Manual wheelchair
			Bed
			Commode
			Absorbent bed sheets

Source: DES.

4.2. Results

4.2.1. Increased functionality and/or longevity of goods/services

Relative life is calculated as the average life of the bundle of equipment supplied under the DES service model divided by the average life of the bundle of equipment supplied under the Base Case (standard equipment supply model).

The average life of a piece of equipment in this scenario is 5.2 years under the DES service model and 0.5 years under the Base Case, meaning that equipment is used for over 1,000 per cent more time under the DES service model compared to the Base Case. In other words, the relative life indicator was estimated to be 10.3.

Relative intensity of use is calculated as the average number of uses during the bundle of equipment's' life under the DES service model divided by the average number of uses during the bundle of equipment's life under the Base Case (standard equipment supply model).

The estimated average number of uses per piece of equipment was estimated to be 24.1 uses under the DES service model and 1.5 uses under the Base Case, meaning that under the DES service model the same bundle of equipment is used by almost 16 times as many clients (i.e. the relative intensity of use indicator was estimated to be 16.1).

4.2.2. Decreased materiality of goods/services

End of use fate of equipment materials is calculated as the proportion of equipment reused, recycled and unrecovered (i.e. sent to landfill) at the end of their use under this client example. The DES service model is compared with the Base Case (standard equipment supply model).

The end of use fate of equipment was estimated to be:

- DES service model: 100 per cent to reuse
- Base Case: 30 per cent to landfill, 20 per cent to recycling and 50 per cent to reuse.

4.2.3. Indicators of broader economic, environmental and social benefit

The net benefit of the DES service model relative to the Base Case was estimated to be approximately $5,901 annually in present value terms. Details of the result are provided in Table 4-2.

There were significantly fewer equipment purchase and reduced equipment supply time costs for the DES service model in comparison to the standard equipment supply model. These reduced costs were offset slightly by additional equipment refurbishment costs, giving an estimated annual cost saving of $4,317 under the DES service model relative to the Base Case. An estimated $1,584 per year in clinician time was saved under the DES service model. Overall these cost savings and additional benefits resulted in an estimated annualised net benefit of $5,901.

Table 4-2 Net benefit results (annualised net present value, $), client example 2[a]

	DES service model	Standard equipment supply model	Net value
Costs			
Equipment purchase	203	4,528	-4,325
Equipment refurbishment	547	0	547
Equipment supply time	252	791	-538
Total costs	*1,002*	*5,319*	*-4,317*
Benefits			
Clinician time	1,584	0	1,584
Total benefits	*1,584*	*0*	*1,584*
Total net benefit ($)	**582**	**-5,319**	**5,901**

[a] In 2018 dollars.

Source: BDO EconSearch analysis.

5. CLIENT EXAMPLE 3 ANALYSIS

5.1. Description

The third client example is an aging client with needs that are stable. Table 4-1 describes the AT equipment needs of the client over the 6-year period.

Table 5-1 Equipment needs, client example 3

New request timeframe	Reason	Equipment request for issue	Equipment to be returned
Initial request	To increase safety with mobility	Walking stick	
2 years	To increase safety with personal care and transfers	Shower chair	
		Traymobile	
		Bedstick	
		Toilet seat raise	
		Bed blocks (8)	
4 years	Additional equipment required	Manual wheelchair	Bedstick
		Commode	
6 years	Return of equipment		Walking stick
			Shower chair
			Traymobile
			Toilet seat raise
			Bed blocks (8)
			Manual wheelchair
			Commode

Source: DES.

5.2. Results

5.2.1. Increased functionality and/or longevity of goods/services

Relative life is calculated as the average life of the bundle of equipment supplied under the DES service model divided by the average life of the bundle of equipment supplied under the Base Case (standard equipment supply model).

The average life of a piece of equipment in this scenario is 5.4 years under the DES service model and 2.9 years under the Base Case, meaning that equipment is used for 88 per cent more time under the DES service model compared to the Base Case. In other words, the relative life indicator was estimated to be 1.88.

Relative intensity of use is calculated as the average number of uses during the bundle of equipment's life under the DES service model divided by the average number of uses during the bundle of equipment's' life under the Base Case (standard equipment supply model).

The estimated average number of uses per piece of equipment was estimated to be 1.8 uses under the DES service model and 1.1 uses under the Base Case, meaning that under the DES service model the same bundle of equipment is used by 64 per cent more clients (i.e. the relative intensity of use indicator was estimated to be 1.64).

5.2.2. Decreased materiality of goods/services

End of use fate of equipment materials is calculated as the proportion of equipment reused, recycled and unrecovered (i.e. sent to landfill) at the end of their use under this client example. The DES service model is compared with the Base Case (standard equipment supply model).

The end of use fate of equipment was estimated to be:

- DES service model: 4 per cent to landfill, 4 per cent to recycling and 92 per cent to reuse
- Base Case: 50 per cent to landfill, 33 per cent to recycling and 17 per cent to reuse.

5.2.3. Indicators of broader economic, environmental and social benefit

The net benefit of the DES service model relative to the Base Case was estimated to be approximately $334 annually in present value terms. Details of the result are provided in Table 5-2.

There were relatively fewer equipment purchase and equipment supply time costs for the DES service model in comparison to the standard equipment supply model. These reduced costs were offset slightly by additional equipment refurbishment costs, giving an estimated annual cost saving of $97 under the DES service model relative to the Base Case. An estimated $237 per year in clinician time was saved under the DES service model. Overall these cost savings and additional benefits resulted in an estimated annualised net benefit of $334.

Table 5-2 Net benefit results (annualised net present value, $), client example 3[a]

	DES service model	Standard equipment supply model	Net value
Costs			
Equipment purchase	74	131	-57
Equipment refurbishment	39	0	39
Equipment supply time	19	98	-79
Total costs	*132*	*229*	*-97*
Benefits			
Clinician time	237	0	237
Total benefits	*237*	*0*	*237*
Total net benefit ($)	**105**	**-229**	**334**

[a] In 2018 dollars.

Source: BDO EconSearch analysis.

6. ORGANISATIONAL LEVEL ANALYSIS

6.1. Description

As described in Section 1.3, the organisational level analysis was limited to the customer groups for which the SA Government will retain funding and policy responsibility post NDIS and Aged Care reforms, namely:

- Disabled people over 65 years of age
- People accessing community palliative care services
- People accessing other State funded programs previously provided by Domiciliary Care.

6.2. Results

6.2.1. Increased functionality and/or longevity of goods/services

Two circular economy indicators were analysed under this category:

- Relative life
- Relative intensity of use.

Relative life is calculated as the average life of the bundle of equipment supplied under the DES service model divided by the average life of the bundle of equipment supplied under the Base Case (standard equipment supply model).

The average life of a piece of equipment in this scenario is 5.0 years under the DES service model and 2.7 years under the Base Case, meaning that equipment is used for 86 per cent more time under the DES service model compared to the Base Case. In other words, the relative life indicator was estimated to be 1.86.

Relative intensity of use is calculated as the average number of uses[10] during the bundle of equipment's life under the DES service model divided by the average number of uses during the bundle of equipment's life under the Base Case (standard equipment supply model).

The estimated average number of uses per piece of equipment was estimated to be 8.1 uses under the DES service model and 1.1 uses under the Base Case, meaning that under the DES service model the same bundle of equipment is used by 7 times as many clients (i.e. the relative intensity of use indicator was estimated to be 7.12).

6.2.2. Decreased materiality of goods/services

One circular economy indicator was analysed under this category, namely the end of use fate of equipment materials.

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[10] Where one use is the equivalent of one prescription (and consequent use) of one piece of equipment by one client.

End of use fate of equipment materials is calculated as the proportion of equipment reused, recycled and unrecovered (i.e. sent to landfill) at the end of their use. The DES service model is compared with the Base Case (standard equipment supply model).

The end of use fate of equipment was estimated to be:

- DES service model: 38 per cent to landfill, 38 per cent to recycling and 24 per cent to reuse
- Base Case: 55 per cent to landfill, 37 per cent to recycling and 9 per cent to reuse.

6.2.3. Indicators of broader economic, environmental and social benefit

One circular economy indicator was analysed under this category, namely lifecycle cost.

A discounted cash flow analysis was undertaken to estimate the lifecycle cost indicator, using a discount rate of 6 per cent.

The net benefit of the DES service model relative to the Base Case was estimated to be approximately $0.7 million annually in present value terms. Details of the result are provided in Table 6-1.

Equipment purchase costs are the same between the two equipment supply models, as expected.

There were relatively lower equipment supply time costs for the DES service model in comparison to the standard equipment supply model. These reduced costs offset slightly the additional equipment refurbishment and facility operating costs, giving an estimated additional cost of $1.4 million annually under the DES service model relative to the Base Case. An estimated $2.1 million in clinician time was saved under the DES service model. Overall this resulted in an estimated annual net benefit of $0.7 million. This net benefit was achieved whilst servicing twice as many clients (i.e. 3,824 clients per year under the DES service model compared with 1,868 clients per year under the standard equipment supply model).

Table 6-1 Net benefit results (annualised net present value, $), SA Government Programs[a]

	DES service model	Standard equipment supply model	Net value
Costs			
Equipment purchase	3,400,000	3,400,000	0
Equipment refurbishment	603,112	0	603,112
Facility operating costs	1,127,590	0	1,127,590
Equipment supply time	1,316,148	1,626,193	-310,045
Total costs	*6,446,851*	*5,026,193*	*1,420,658*
Benefits			
Clinician time	2,106,605	0	2,106,605
Total benefits	*2,106,605*	*0*	*2,106,605*
Total net benefit ($)	**-4,340,246**	**-5,026,193**	**685,947**

[a] In 2018 dollars.

Source: BDO EconSearch analysis.

7. DISCUSSION

This study analysed the performance of the DES service model against a standard government delivery of programs model, using a number of circular economy indicators, namely:

1. Relative life of equipment
2. Relative intensity of use of equipment
3. End of use fate of equipment materials
4. Lifecycle cost to deliver AT.

With regard to the functionality and longevity of goods and services aspects of a circular economy business model, the average life of a piece of equipment was estimated to be 5.0 years under the DES service model compared with 2.7 years under the standard equipment supply model, meaning that equipment is used for 86 per cent more time under the DES service model compared to the standard equipment supply model. Likewise, the estimated average number of uses per piece of equipment was estimated to be 8.1 uses under the DES service model and 1.1 uses under the standard equipment supply model, meaning that under the DES service model the same bundle of equipment is used by 7 times as many clients. With the same equipment purchase budget and equipment pool, DES is able to get more utility out of equipment using Government funding more effectively and, importantly, servicing twice as many clients[11].

With regard to the materiality of goods and services, end of use fate of equipment materials was analysed by estimating the proportion of equipment reused, recycled and unrecovered (i.e. sent to landfill) at the end of their use. The end of use fate of equipment was estimated to be:

- DES service model: 38 per cent to landfill, 38 per cent to recycling and 24 per cent to reuse
- Standard equipment supply model: 55 per cent to landfill, 37 per cent to recycling and 9 per cent to reuse.

These results demonstrate that the DES business model diverts a significant amount of material from landfill to reuse. This is consistent with the DES aim to maximise the useful life of equipment and components and maintain their value through reuse.

With regard to indicators of broader economic, environmental and social benefit, the lifecycle cost indicator was assessed. This was estimated as the sum of investment[12], operating and social[13] costs net of social benefits[14] discounted to a present value. For the same equipment budget, the DES service model delivered approximately $0.7 million annually in net benefits. Relative to the standard equipment supply model, increased costs of equipment refurbishment and facility operating costs (approximately $1.7 million) were offset by approximately $2.4 million in benefits from avoided welfare costs to clients (from reduced

11 Servicing an estimated 3,824 clients per year under the DES service model compared with 1,868 clients per year under the standard equipment supply model.
12 Equipment purchase and refurbishment.
13 Equipment delivery time impacts on clients.
14 Better use of clinician resources.

equipment supply times) and better use of clinician resources. This net benefit was achieved whilst servicing twice as many clients.

The analysis included three client example analyses which were representative of the DES customer groups funded by the SA Government. They covered:

- Client with changing needs over a long period
- Client using the palliative care system
- Client with needs that are stable.

The palliative care client example analysis produced the best results in terms of the circular economy indicators assessed, whilst the long-term, stable needs client example produced the most modest results. However, it should be noted that for all the circular economy indicators across all the client examples the results were more positive than the equivalent examples under the standard equipment supply model.

Palliative care clients have short-term needs for a number of AT equipment. In this situation, with the standard equipment supply model there is significant potential for 'wastage' of equipment and the DES service model, where equipment can be efficiently recovered, refurbished and returned to use, is a much more efficient business model. This is much less the case with clients with long-term, stable AT equipment needs, where equipment is more likely to be used fully over the equipment's effective life. However, the DES service model still provides benefits by reducing costs, reducing wastage of equipment and clinician resources and reducing equipment supply times.

REFERENCES

EconSearch 2018, *Circular Economy Case Studies – Potential Indicators Working Paper*, a report to Green Industries SA, August.

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National Aged Care Alliance (NACA) 2018, *Assistive Technology for Older Australians*, Position Paper, June.

Disclaimer

The assignment is a consulting engagement as outlined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 17. Consulting engagements employ an assurance practitioner's technical skills, education, observations, experiences and knowledge of the consulting process. The consulting process is an analytical process that typically involves some combination of activities relating to: objective-setting, fact-finding, definition of problems or opportunities, evaluation of alternatives, development of recommendations including actions, communication of results, and sometimes implementation and follow-up.

The nature and scope of work has been determined by agreement between BDO and the Client. This consulting engagement does not meet the definition of an assurance engagement as defined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 10.

Except as otherwise noted in this report, we have not performed any testing on the information provided to confirm its completeness and accuracy. Accordingly, we do not express such an audit opinion and readers of the report should draw their own conclusions from the results of the review, based on the scope, agreed-upon procedures carried out and findings.

APPENDIX 1 INITIAL LIST OF INDICATORS FOR THE PILOT CASE STUDY

Appendix Table 1-1 Initial list of indicators for the pilot case study

Indicator	Quantitative or qualitative?	Data and method	Notes
Increased functionality and/or longevity of goods/services			
Relative life	Quantitative	Calculated as: average life of product[a]/average life of industry standard product	
Relative intensity of use	Quantitative	Calculated as: average no. functional uses during product's life/ average no. functional uses during industry standard product's life	
Relative utility	Quantitative	Calculated as: relative life * relative intensity of use	
Decreased materiality of goods/services			
Material content of product	Quantitative	Proportion (by mass) of virgin, reused and recycled material content of a product. Indicators can be compared to an industry standard product	This can be assessed on a per item or a per functional use basis
End of life fate of product materials	Quantitative	Proportion (by mass) reused, recycled and unrecovered waste. Note that unrecovered waste includes components sent straight to waste (landfill, WtE) and unrecovered waste from recycling and reuse streams. Reused and recycled components are net of unrecovered waste from recycling and reuse streams	As above

Indicator	Quantitative or qualitative?	Data and method	Notes
Decreased dependence on use of GHG causing fossil fuels			
Energy footprint	Quantitative	Calculated as the energy consumption over the life of the product: sum of embedded energy consumption in the production of the product inputs, product manufacture, product use, product disposal. Compared against the industry average product	Unlikely to be assessed with DES case study due to complexity of case study. Is likely to require access to LCA expertise and databases
Carbon footprint	Quantitative	Calculated as the GHG emissions over the life of the product: sum of embedded energy consumption in the production of the product inputs, product manufacture, product use, product disposal. Compared against the industry average product	See above
Indicators of broader economic, environmental and social benefit			
Toxic material substitution	Qualitative	Substitution of toxic materials with less toxic materials. Toxic materials: materials on the SIN list*. Less toxic materials: materials not on the SIN List	*Substitute It Now! (SIN) List from the International Chemical Secretariat (ChemSec): the chemicals on the SIN List have been identified by ChemSec as Substances of Very High Concern based on the criteria established by the EU chemicals regulation REACH
Lifecycle cost	Quantitative	Calculated as sum of investment/capital/production costs, operating costs and end-of-life costs net of any quantified social benefits discounted to a present value. Compared against the industry average product	

Indicator	Quantitative or qualitative?	Data and method	Notes
Return on investment	Quantitative	Calculated as profit generated by the investment/investment cost. Can be calculated from lifecycle cost analysis	May need to be calculated as a social return on investment for DES case study, where profit is replaced by social benefits
Payback period	Quantitative	Calculated as the amount of time it takes for the profit generated by the investment to pay for the cost of the investment. Can be calculated from lifecycle cost analysis	May not be applicable to DES case study
Local employment	Quantitative	Calculated as the number of fte jobs in SA maintained per functional unit of the product relative to the equivalent industry standard product	This may not be applicable to all case studies

[a] Note that the term 'product' is used in the table, but is interchangeable with 'service'.