



# Technical notes

## Consumer Price Index



## Table of Contents

Introduction .....	3
Construction of the CPI .....	4
Target population .....	4
Conceptual approach .....	4
Classification system .....	4
Weighting the basket .....	5
Weighting for the co-op and bulk stores .....	6
Excluding out of scope spending .....	8
Selecting the basket .....	8
Non-period specific data quality information .....	11
Collection methods .....	11
Pricing frequency .....	11
Imputation .....	11
Care required when using the CPI to adjust monetary values .....	11
Accuracy of the data .....	12
Elementary aggregate formula .....	12
Index formulae .....	12
Population weights .....	13
Table 2 Population weights for the CPI .....	13
Index reference period .....	13
Interpreting the data .....	14
Rounding of index numbers and calculation of percentage changes .....	14
Timing of published data .....	14
Liability .....	14
Timing .....	14
Appendix .....	15

## List of Tables

Table 1 – Indirect and direct expenditure by group .....	6
Table 2 – Items in the CPI basket .....	8
Table 3 – Population weights for the CPI .....	13
Table 4 – Expenditure Weights .....	15

## Introduction

The Consumer Price Index (CPI) is a measure of the price change of goods and services purchased by Tokelau households. The CPI measures the changing cost of purchasing a fixed basket of goods and services which represents the average expenditure pattern of Tokelau households at the index base period.

This document discusses background information to the construction of Tokelau's CPI, and non-period specific data quality implications. The information in this document is aimed at a technical audience.

This document was published 12 December 2012.

## Construction of the CPI

### Target population

The target population for the CPI is Tokelau-residents, living in private households. This means that the target population does not include:

- overseas visitors who expect to be resident in Tokelau for fewer than 3 months
- overseas Tokelauans working for the public service in Apia
- Tokelauan residents temporarily overseas
- schools, hospitals, or other non-private institutions.

For CPI purposes, a 'household' is a group of people who share a private dwelling. They generally share food consumption and preparation and contribute towards providing the essentials for living as a group.

### Conceptual approach

The Tokelau CPI is based on a 'payment' concept. The payment approach measures price change over time for the net expenditure on goods and services by the household sector overall. The payment approach relates to the period of time when the actual payments for the product are made. This can differ from the period when it is acquired and when it is used. A CPI based on this approach will measure the change in the cost of purchasing a commodity over time.

### Classification system

The Tokelau CPI uses the international standard Classification of Individual Consumption according to Purpose (COICOP), developed by the United Nations.

The following COICOP areas are not part of the Tokelau CPI:

- Health
- Education
- Rental accommodation, and housing construction

Primary level universal health care is provided free of charge on all three atolls. Medical issues that cannot be catered for on atoll are referred to either Samoa or New Zealand under the Tokelau Patient Referral Scheme. Therefore household expenditure on health is expected to be minimal, and is not included in the CPI.

Tokelau has a free, compulsory education system for primary and secondary students up to the age of 16. A distance learning foundation course run by the University of the South Pacific is freely available in Tokelau for students who want to get ready for tertiary study. A scholarship scheme also offers students the chance to undertake tertiary study abroad.

A housing scheme funded by the New Zealand Government began in the early 1980s. The scheme allows households in Tokelau to apply to their tapulega (village council / administration) for funding to improve their own housing. The scheme still runs today, and two or three houses a year are approved for funding.

## Weighting the basket

### Data sources for weighting the basket

Weights show the relative importance of an item to the overall set of items.

The 2012 weight construction was based on administrative information compiled from several sources across the wider Tokelau Government. Weights are constructed using payment and expenditure information derived from source data.

The sources include:

- purchase and import information for the co-op stores
- sales information for the bulk stores
- record of passenger travel to, and from Tokelau
- electricity and telecommunication costs and expenditure
- costs associated with the private importation of goods.

The Tokelau CPI currently has a weight reference period of the year to 30 June 2012. All data sources have a reference period that match this period, with the exception of privately imported goods.

Due to data availability, sources used to calculate private expenditure on imported goods have a reference period of four months to 30 November 2012. This was then annualised to represent the year to 30 June 2012.

The sources of information used to weight the basket vary in quality. Each source is discussed in more detail below. Furthermore, large, infrequent purchases (such as the purchase of boats, water-tanks, or cars) may not be accurately represented in estimates of total household expenditure.

### What the basket represents

The goods and services in the CPI basket are a sample that represents the wider range of goods and services purchased by households. There are 92 individual goods and services in the basket, as listed in Table 2.

The expenditure weights assigned to the 92 goods and services in the basket represent expenditure on those goods and services. But they also represent expenditure on similar goods and services not directly included in the basket but expected to exhibit similar price change. For example, apples and oranges are in the basket but bananas are not. Expenditure on bananas (and other fruit not in the basket) is allocated to apples and to oranges in proportion to spending directly on each of these two fruits.

Table 1 shows the proportion of the expenditure weights contributed directly from the sources above for the goods and services included in the CPI basket (e.g. oranges), and the proportion contributed by goods and services not directly included in the basket (e.g. bananas). Table 4 shows the proportion of expenditure weights as assigned to COICOP groups and selected subgroups.

**Table 1**  
**Indirect and direct expenditure by group**

Group	Direct proportion (%)	Indirect proportion (%)	Total
01 – Food and non-alcoholic beverages	90.8	9.2	100.0
02 – Alcoholic beverages and tobacco	98.3	1.7	100.0
03 – Clothing and footwear	79.8	20.2	100.0
04 – Housing, water, electricity, gas and other fuels	99.6	0.4	100.0
05 – Furnishings, household equipment and routine household maintenance	77.3	22.7	100.0
07 – Transport	67.7	32.3	100.0
08 – Communication	100.0	-	100.0
12 – Miscellaneous goods and services	82.2	17.8	100.0
<b>All Groups</b>	<b>90.3</b>	<b>9.7</b>	<b>100.0</b>

Table 1 shows that just over 90 percent of expenditure was directly on goods and services in the basket. The remainder was spending on goods and services not directly included in the basket.

## Weighting for the co-op and bulk stores

The data sources used to weight household expenditure from the co-op and bulk stores are slightly different.

Both the co-op and bulk store import all of their products from overseas, generally from Samoa and New Zealand. Purchasing and shipping of imported items is organised through the Department of Transport and Support Services. There is a co-op, and a bulk store in each village (nuku).

### Co-op stores

Co-op stores in Tokelau act much like supermarkets, selling items primarily for household consumption. All items imported by the co-op stores are logged in manifests. The manifests include information on date of shipment, purchase and sale cost, as well as descriptive information about the items.

The manifest is the primary source of information for deriving expenditure weights for the CPI.

Not all items imported by the co-op stores are sold just to households. Some items are sold to households and/or the nuku, hospital, or other non-household entities. Only items sold to private households are considered in scope for the CPI.

### Bulk stores

Bulk stores in Tokelau act much like hardware stores in other countries. The bulk stores provide products for use in building construction and maintenance. Many of the materials imported for sale in the bulk stores are purchased for non-household use.

The bulk-stores keep financial records of all purchases made by customers. These records store information about the total cost of the purchase, and who made the purchase. From these logs it is possible to determine whether a purchase was made by a private individual or by a non-private organisation, such as the tapulega, hospital, or school. For the purpose of the CPI, the Tokelau National Statistics Office (TNSO) considers all bulk-store purchases made by private individuals as household expenditure.

These records provide a good source of determining household expenditure from non-household expenditure, but they do not contain information on individual items of purchase. For example, they do not provide information on how much household expenditure should be allocated to paint, or timber. Expenditure on items purchased by households from bulk stores is proportioned using item level weights from the Samoa Bureau of Statistics CPI.

## **Weighting for services**

### **Electricity**

Information on household expenditure on electricity is currently collected independently by each nuku. The collection of information on household expenditure occurs infrequently and without any systematic process or rigid quality controls, which makes the assessment of data quality difficult.

In 2012, Tokelau transformed its power generation from being entirely dependent on imported diesel, to having 1.5 times of existing capacity generated by solar panels. A loan from the New Zealand Government funded the installation of the solar panels. As of December 2012, there are no plans for the Department of Energy to review electricity charges as a result of the switch to solar energy.

### **Telecommunications**

Teletok is the only telecommunications company in Tokelau. Teletok is a state owned enterprise and runs fixed line telephone and broadband Internet services. There is no mobile service in Tokelau.

The Internet in Tokelau is run through a central firewall, where all users log-on through their Internet browsers. This means that a user can log on at any access point, or computer, and have their usage charged to their account.

Teletok was able use its administrative records to provide all the requested information used by the TNSO in weight construction.

For more statistics on household Internet use in Tokelau, see the 2011 Tokelau Census – available at <http://TokelauNSO.tk>

### **Transport - private cargo**

The Department of Transport manages the shipping of all goods in and out of Tokelau.

All vessel manifests include information on individuals who have shipped the goods. The TNSO used these manifests to calculate the value of private goods shipped into Tokelau over a 12-month period. The TNSO was only able to access manifests for privately shipped goods for the four months to 30 November 2012. This expenditure was rated up to represent expenditure over a 12-month period. This can potentially affect the expenditure estimates, especially if the transport of private cargo has a seasonal pattern (such as changes due to the Christmas period).

All in-scope items imported privately are considered as household goods for the purpose of the CPI.

### **Transport - passengers**

The Department of Transport records the number of passengers on all sailings to and from Tokelau as a part of its administrative business processes.

The Department of Transport’s administrative information does not include information on whether a passenger is travelling privately, or non-privately (ie for government, or nuku purposes). Nor do the records state whether a passenger is a child or adult. Children travel for half the cost of an adult. The TNSO used this data, along with estimated proportions (private adult and child travel, and non-private travel) to derive the household expenditure on passenger transport.

## Excluding out of scope spending

A key step in constructing CPI expenditure weights is to ensure that the estimates include expenditure made by the CPI reference population. Expenditure by others is out of scope of the CPI and needs to be excluded from the expenditure weights. In addition to people not covered by the CPI, expenditure by businesses and government also needs to be excluded.

Where possible, data providers were asked to report expenditure information that closely matched the scope of the CPI. However, in practice, many providers were not able to disaggregate their data to the level required. The TNSO had to estimate what proportion of a particular expenditure was in scope of the CPI when using the information to derive expenditure weights.

Excluding out-of-scope expenditure involved deriving a set of specific adjustment ratios for various areas of the basket. Appropriate ratios were then applied to the corresponding independently sourced expenditures.

## Selecting the basket

The items making up the CPI basket represent the much wider range of goods and services that households purchase.

**Table 2**  
**Items in the CPI basket<sup>1</sup>**

Item	Pricing Location	COICOP Group
Biscuits/crackers	Co-op store	01 – Food and non-alcoholic beverages
Breakfast cereal		
Cheese flavoured corn snack		
Flour		
Noodles		
Rice		
Spaghetti, canned		
Beef		
Chicken		
Corned beef, canned		
Lamb/mutton		
Sausages		
Fish, canned		
Cheese		
Condensed milk, canned		
Eggs		

<sup>1</sup> For the purpose of this table some items have been collapsed into broader categories.

Flavoured milk drink		
Milk - long life		
Milk powder		
Butter		
Cooking oil		
Apples		
Fruit salad, canned		
Oranges		
Pineapple, canned		
Cabbages		
Frozen vegetables		
Onions		
Potatoes		
Potato chips		
Chewing gum		
Ice cream		
Sugar		
Baby formula		
Mayonnaise		
Tomato sauce, canned		
Chocolate flavoured drink powder		
Tea bags		
Bottled water		
Fruit drink powder		
Fruit juice		
Instant coffee		
Spirit - gin		
Spirit - vodka		
Beer - large bottle	Co-op store	02 – Alcoholic beverages and tobacco
Beer - small bottle		
Cigarettes		
Fabric	Co-op store	03 – Clothing and footwear
Jandals		
Cement		
Paint		
PVC pipes	Bulk store	
Roofing iron		
Timber		
Electricity	Department of Energy	
LPG gas		
Kerosene	Co-op store	
Clothing chest		
Refrigerator	Samoa Bureau of Statistics	05 – Furnishings, household equipment and routine household maintenance
Sefe		

Battery	Co-op store	
Torch		
Aluminium foil		
Dishwashing paste		
Disinfectant		
Fabric softener		
Fly spray		
Mosquito coil		
Nails	Bulk store	
Washing powder	Co-op store	
Marine/lubricant spray	Co-op store	07 – Transport
Petrol		
Boat transport	Department of Transport	
Internet – prepaid	Teletok	08 – Communication
Internet – postpaid		
Telephone charges – line rentals		
Telephone charges – tolls		
Baby oil	Co-op store	12 – Miscellaneous goods and services
Deodorant		
Hair conditioner		
Hair shampoo		
Nappies		
Sanitary pads		
Soap		
Toilet paper		
Tooth paste		
Lighter		

## **Non-period specific data quality information**

### **Collection methods**

Prices used in the CPI are collected through three main methods: price collection from retail outlets, telephoning respondents, and contacting the Samoan Bureau of Statistics.

Co-op store managers act as price collectors for the TNSO. They also collect prices at the bulk stores.

At the beginning of each pricing period, the TNSO makes contact with the store managers, and sends out pricing sheets. The store managers undertake item pricing, and send the completed sheets back to the TNSO in Apia, Samoa. The store managers are regularly trained by the TNSO.

Because of the varying availability of trained on-atoll staff, in some instances prices must be collected over the phone, or via email. This is undertaken by a trained member of the TNSO.

Not all goods common to households can be purchased in Tokelau. Some goods are purchased directly in Samoa by Tokelau households. For these goods, the corresponding price index in the Samoa Bureau of Statistics' CPI is used to represent the costs faced by Tokelau households.

### **Pricing frequency**

Prices are collected once each quarter, except for services such as transport, telecommunications, and energy. These prices are monitored, and updated when change occurs. Change in the price for these services is rare.

### **Imputation**

Imputation refers to the statistical practice of replacing missing variables, such as item prices with estimated values.

Because of Tokelau's geographic isolation, product availability fluctuates significantly between pricing periods.

Due to item unavailability at the time of price collection, about 15 percent of prices are imputed each quarter. This is generally done by either carrying forward the previous quarter's price, or by applying the movements of similar categories of items.

### **Care required when using the CPI to adjust monetary values**

The CPI can be used to adjust monetary values, such as those in legislation and contracts. Some goods and services in the CPI are not subject to tax, and tax regimes vary across the nuku, and across time. This change in tax can have an impact on a reported change in CPI. Generally, it would not be appropriate to adjust monetary values not subject to tax, by a CPI value change that has been affected by tax change.

## Accuracy of the data

### Elementary aggregate formula

Average prices in the CPI are called elementary aggregates. These elementary aggregates are the first level of the index aggregation. The geometric mean, or Jevons, formula is used by many national statistical offices to calculate the elementary aggregate indexes for items where outlet substitution is possible. The 'ratio of arithmetic mean prices', or Dutot, formula is used by national statistical offices for items where households cannot easily substitute the outlet they purchases from, or where prices are subsidised and may fall to zero.

In Tokelau, outlet substitution is generally not a possibility for households as there is largely only one outlet on each atoll for each type of good or service. For this reason, prices are aggregated directly to a national elementary aggregate in the Tokelau CPI using the Dutot formula.

### Index formulae

The index is calculated using the price relative form of the base weighted Laspeyres formula.

#### Laspeyres index

$$\text{Index} = \frac{\sum (P_{it} Q_{io})}{\sum (P_{io} Q_{io})} \times 1000$$

Where  $P_{it}$  = Price of item  $i$  ( $i = 1, \dots, m$ ) in period  $t$

$P_{io}$  = Price of item  $i$  ( $i = 1, \dots, m$ ) in the base period

$Q_{io}$  = Quantity of item  $i$  purchased in the base period

The Laspeyres index measures the change in cost of purchasing the same basket of goods and services in the current period as was purchased in the specified base period. The prices are weighted by quantities in the base period.

The price relative form of the Laspeyres index is used by TNSO, and by many national statistical offices around the world.

#### Laspeyres price relative index formula

$$\text{Index} = \frac{\sum E_{io} \frac{P_{it}}{P_{io}}}{\sum E_{io}} \times 1000$$

Where  $P_{it}$  = Price of item  $i$  ( $i = 1, \dots, m$ ) in period  $t$

$P_{io}$  = Price of item  $i$  ( $i = 1, \dots, m$ ) in the base period

$E_{io}$  = Expenditure on item  $i$  purchased in the base period

= P<sub>io</sub>Q<sub>io</sub>

It produces the same results as the basic Laspeyres formula but means that expenditure data can be used directly in the index formula.

## Population weights

Population weights are used to allocate the national expenditure weights of goods and services to the CPI pricing centers, Atafu, Fakaofu, and Nukunonu.

For example, the population weights ensure that a price change in Fakaofu (which has 39.3 percent of the population weight) would have almost 1.5 times the effect on the national CPI than the same price change in Nukunonu (which has 27.0 percent of the population weight).

The 2011 Tokelau Census of Population and Dwellings, usually resident population present in Tokelau on census night count is used to represent the target CPI population.

More information on this count can be found in the *Ata o Tokelau: Profile of Tokelau*, available at <http://TokelauNSO.tk>

**Table 3**  
**Population weights for the CPI**

Atoll	Weight (%)
Atafu	33.7
Fakaofu	39.3
Nukunonu	27.0

## Index reference period

All CPI indexes have an index reference period of the June 2012 quarter (=100.0).

## **Interpreting the data**

### **Rounding of index numbers and calculation of percentage changes**

Percentage changes are published to one decimal place and are calculated from index numbers rounded to one decimal place.

### **Timing of published data**

The first release of the CPI was published on 12 December 2012, for the June and September 2012 quarters.

The December 2012 quarter will be published in January 2013.

After this the TNSO will aim to publish each quarter within one month of the quarter's end. The publication date of the CPI will be announced on the TNSO website, three weeks before publication.

### **Liability**

While all care and diligence has been used in processing, analysing, and extracting data and information in this publication, The TNSO gives no warranty it is error-free and will not be liable for any loss or damage suffered by the use directly, or indirectly, of the information in this publication.

### **Timing**

Our information releases are delivered electronically by third parties. Delivery may be delayed by circumstances outside our control. The TNSO does not accept responsibility for any such delay.

## Appendix

### Table 4

#### Consumer price index

Expenditure weights

Groups and selected subgroups

Group or subgroup	Base expenditure weight
	June 2012 quarter
	Percent <sup>(1)</sup>
<b>Food and non-alcoholic beverages group</b>	41.94
Food	36.35
Non-alcoholic beverages	5.59
<b>Alcoholic beverages and tobacco group</b>	22.14
Alcoholic beverages	5.59
Cigarettes and tobacco	16.55
<b>Clothing and footwear group</b>	1.10
<b>Housing, water, electricity, gas and other fuels group</b>	9.70
<b>Furnishings, household equipment and routine household maintenance group</b>	5.73
<b>Transport group</b>	9.19
<b>Communication group</b>	4.94
<b>Miscellaneous goods and services group</b>	5.24
<b>All groups</b>	100.00

1. Due to rounding, individual figures may not sum to stated totals.

Source: Tokelau National Statistics Office