

Data Visualization

Charting change in official development assistance to Laos

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Definition and objective of data visualization

- **Data visualization** is a process that **transforms raw data into an image**, which is **readable** by viewers and supports **exploration** and **communication** of the data.
- **Data visualization** is used:
 - To conduct **analyses** of different forms of data
 - To support **communication** of complex information to a wide range of stakeholders

Data visualization: Three principles

Principle 1: Show the data – Emphasize data of interest

Principle 2: Reduce the clutter – Eliminate unnecessary elements of visual elements

- dark gridlines
- unnecessary tick marks, labels, text, icons, pictures, or dimensions
- ornamental shading and gradients

Principle 3: Integrate the text and the graph – contain enough information to stand alone

Process of data visualization

- **Know the message – purpose of the chart**
- **Arrange data**
- **Prepare chart**
- **Format chart**

Purpose of data visualization and chart type

Chart type	Purpose			
	Trend	Comparison	Relationship	Parts to whole
Line	✓		✓	
Bar	✓	✓		
Bubble		✓	✓	
Pie		✓		✓

Charting change in ODA inflows to Laos

Purpose	Chart type	Variable	Data source
Laos' position in total LDC recipients of ODA	Horizontal bar	ODA per capita; share of ODA in GNI	World Bank's World Development Indicator (http://data.worldbank.org/data-catalog/world-development-indicators)
Correlation of ODA and LDC criteria	Bubble	ODA per capita; human asset index; economic vulnerability index; GNI per capita	UN database (http://www.un.org/en/development/desa/policy/cdp/ldc/ldc_data.shtml)
Trends of total, bilateral, and multilateral ODA	Line	Total ODA; bilateral ODA; multilateral ODA	OECD database (http://stats.oecd.org/Index.aspx?QueryId=58197)
Structure of Laos' ODA inflows in 1995-2000 and 2010-2014	Pie	ODA by sector	OECD database (http://stats.oecd.org/Index.aspx?QueryId=58197)

Horizontal bar chart: Laos' position in total LDC recipients of ODA

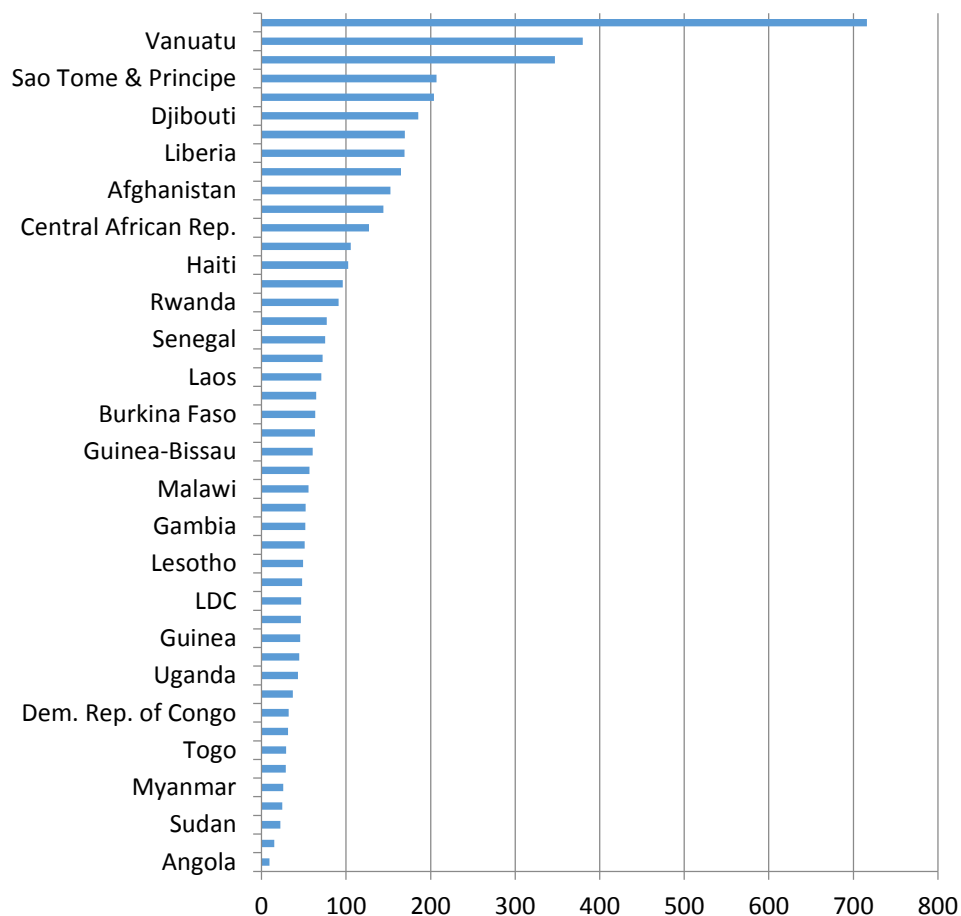
Table 1: ODA per capita, economic vulnerability index, and human asset index

No.	Countries	EVI	HAI	ODA pc (\$)	No.	Countries	EVI	HAI	ODA pc (\$)
1	Kiribati	71.5	86.3	716	24	Guinea-Bissau	53.6	44.8	60
2	Vanuatu	47.7	81.3	380	25	Benin	31.2	50.1	57
3	Solomon Islands	50.8	71.7	347	26	Malawi	41.1	53.7	56
4	Sao Tome & Principe	39.2	77.4	207	27	Cambodia	38.3	67.2	52
5	Timor-Leste	55.0	57.4	204	28	Gambia	70.7	62.1	52
6	Djibouti	37.7	54.6	186	29	United Rep. of Tanzania	28.8	52.0	51
7	Bhutan	40.2	67.9	170	30	Lesotho	42.9	62.9	49
8	Liberia	57.9	46.2	169	31	Niger	37.6	34.7	48
9	South Sudan	56.0	29.1	165	32	Burundi	49.9	41.0	46
10	Afghanistan	35.1	43.1	153	33	Guinea	24.9	38.7	46
11	Sierra Leone	48.9	34.8	144	34	Yemen	35.4	59.8	44
12	Central African Rep.	33.5	22.9	127	35	Uganda	31.8	53.6	43
13	Somalia	36.3	7.8	105	36	Ethiopia	31.8	39.2	37
14	Haiti	34.1	39.3	102	37	Dem. Rep. of Congo	30.3	29.9	32
15	Comoros	45.8	54.2	96	38	Nepal	26.8	68.7	31
16	Rwanda	40.7	51.5	91	39	Togo	33.6	58.7	29
17	Mozambique	38.1	41.7	77	40	Chad	46.0	24.4	29
18	Senegal	33.0	55.9	75	41	Myanmar	33.7	72.7	26
19	Mali	33.3	45.5	72	42	Madagascar	36.7	53.5	25
20	Laos	36.2	60.8	71	43	Sudan	49.9	56.6	22
21	Mauritania	41.2	49.5	65	44	Bangladesh	25.1	63.8	15
22	Burkina Faso	39.5	36.5	64	45	Angola	39.7	41.9	10
23	Zambia	45.6	40.8	63		LDC	41.4	51.5	47

Note: ODA is in 2014; EVI and HAI are in 2015. 45/48 are used due to unavailable ODA data for Equatorial Guinea, Eritrea, and Tuvalu.

LDC graduation criteria: 1. GNI pc \geq 1.242; 2. HAI \geq 66; 3. EVI \leq 32

Fig.1A: ODA per capita (US\$) in LDCs, 2014

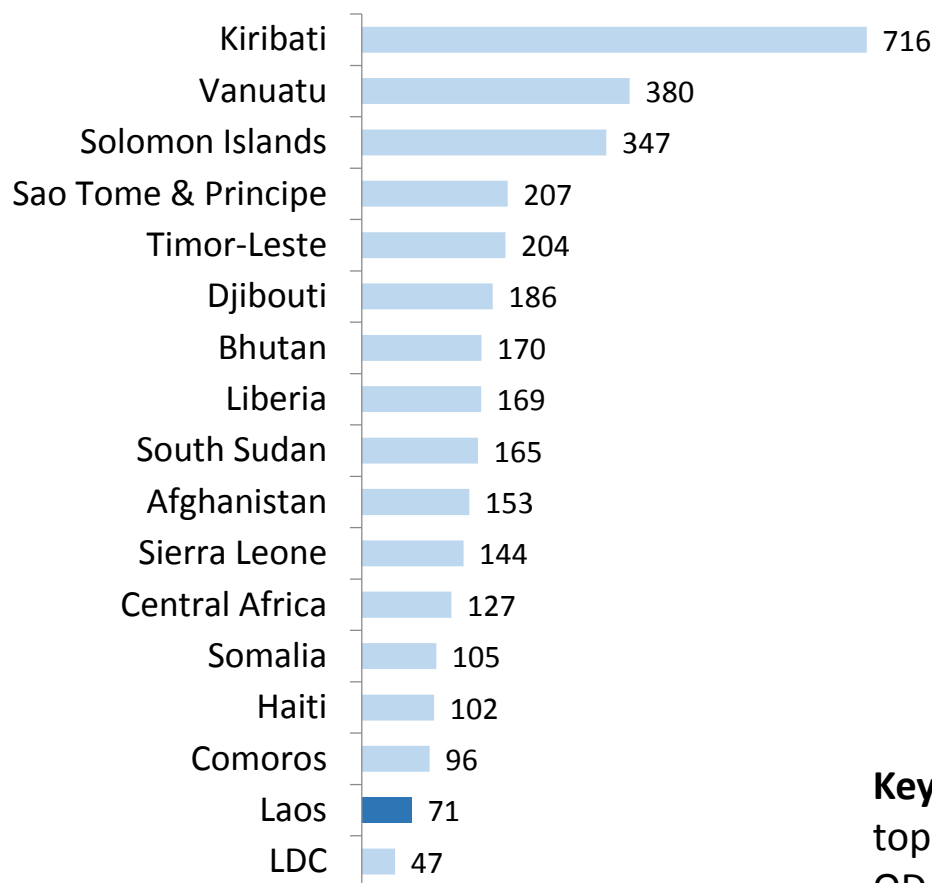


Analyzing Fig.1A based on the principles of data visualization:

- **P1. Show data:** Lao data is not illustrated in the chart.
- **P2. Reduce the clutter:** there are vertical gridlines.
- **P3. Integrate the text and the chart:** text is integrated into the chart but not emphasize.

Fig.1B: ODA per capita (US\$) in LDCs, 2014

(Redesigned chart)

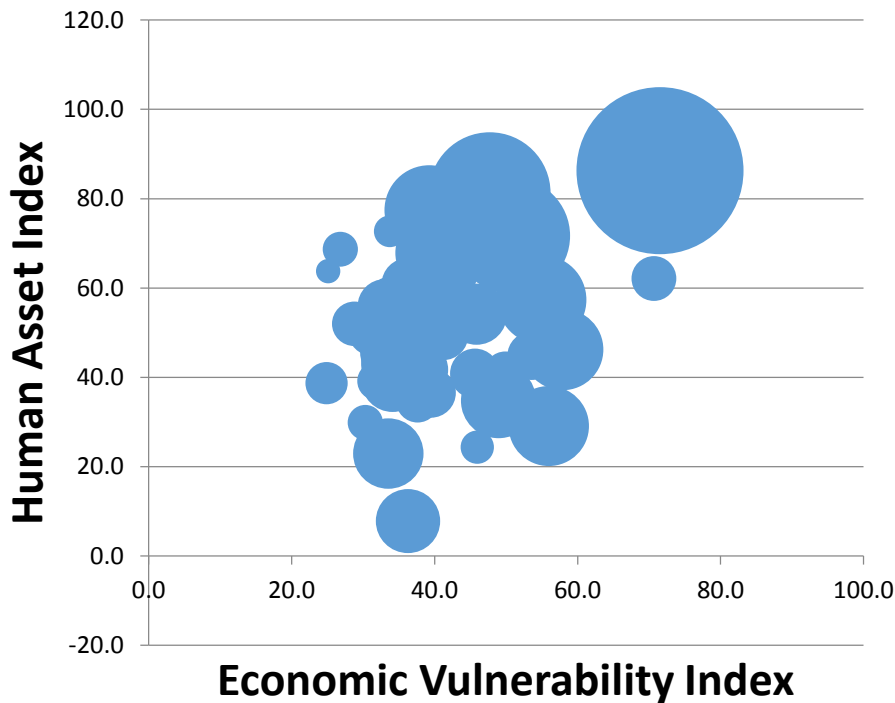


Redesigned chart to emphasize the ranking:

- **P1. Show data:** (1) compare Laos' ODA per capita with that of 15 LDCs; (2) show values of ODA per capita.
- **P2. Reduce the clutter:** remove vertical gridlines.
- **P3. Integrate the text and the chart:** use dark blue bar to emphasize Laos.

Key message: Laos' ODA per capita is lower than the top 15 LDC recipients, but is higher than the average ODA per capita of LDCs.

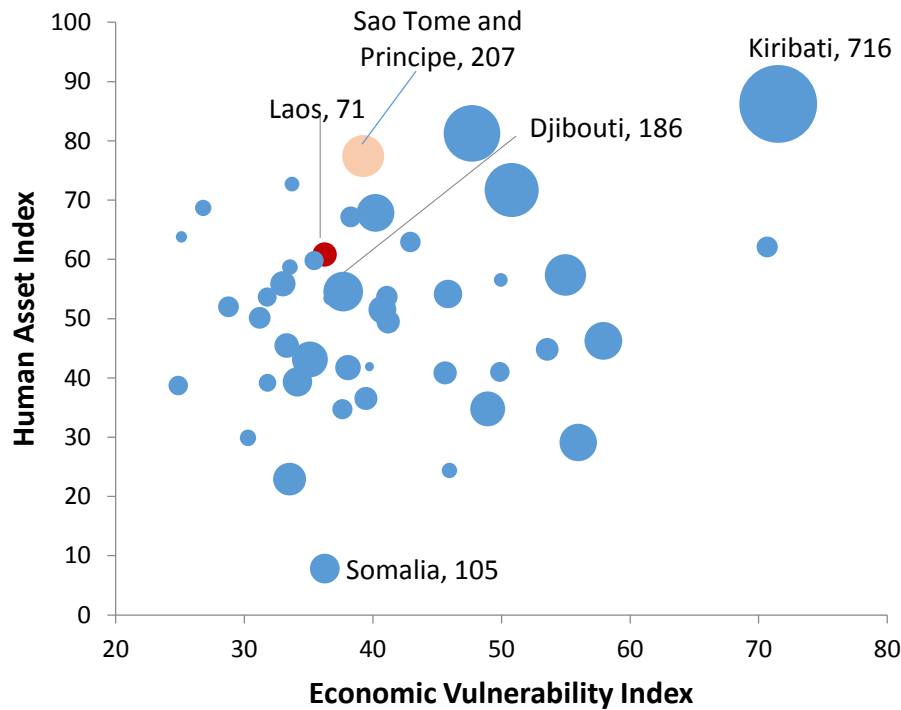
Fig.2A: Correlation of ODA per capita (US\$) and LDC criteria



Analyzing Fig.2A based on the principles of data visualization:

- **P1. Show data:** Lao data is not illustrated in the chart.
- **P2. Reduce the clutter:** there are horizontal gridlines; font size of axis titles is too big; circles are too big.
- **P3. Integrate the text and the chart:** no country name and data exist in the chart.

Fig.2B: Correlation of ODA per capita (US\$) and LDC criteria (Redesigned chart)

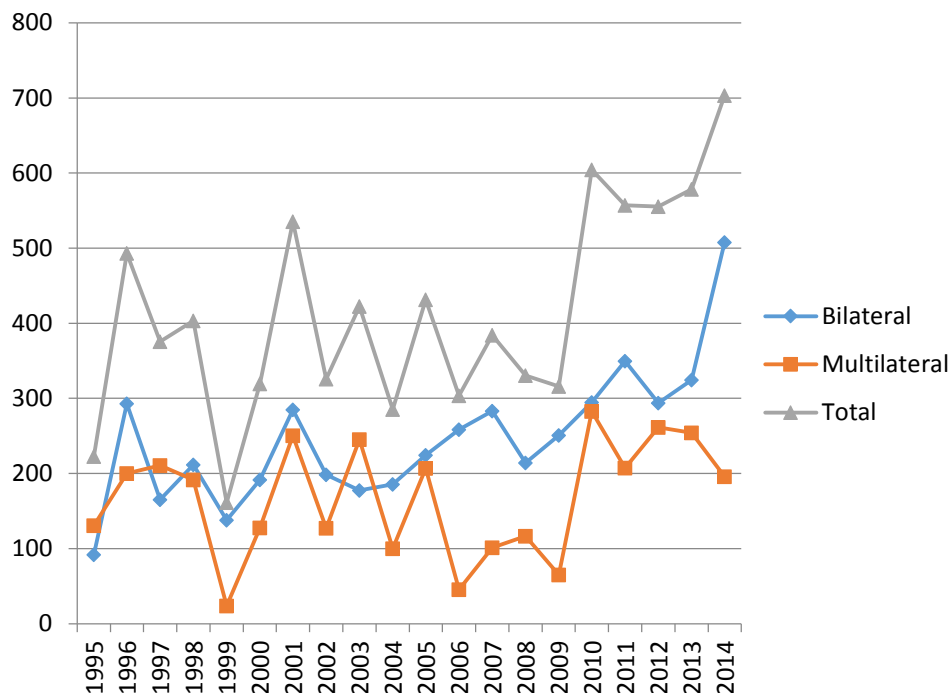


Redesigned chart to support comparative analysis of ODA and LDC criteria:

- **P1. Show data:** (1) reduce bubble size; (2) show values of ODA per capita for Laos and other countries for comparison.
- **P2. Reduce the clutter:** remove horizontal gridlines; reduce font size of axis titles.
- **P3. Integrate the text and the chart:** country names are shown in the chart.

Key message: the correlation between ODA per capita and LDC criteria in Laos is in line with other LDCs, but there is an opportunity to attract more ODA to improve its HAI as shown by Sao Tome and Principe.

Fig.3A: Development of Laos' ODA inflows by bilateral donors and multilateral institutions, 1995-2014
(million US\$ in 2014)

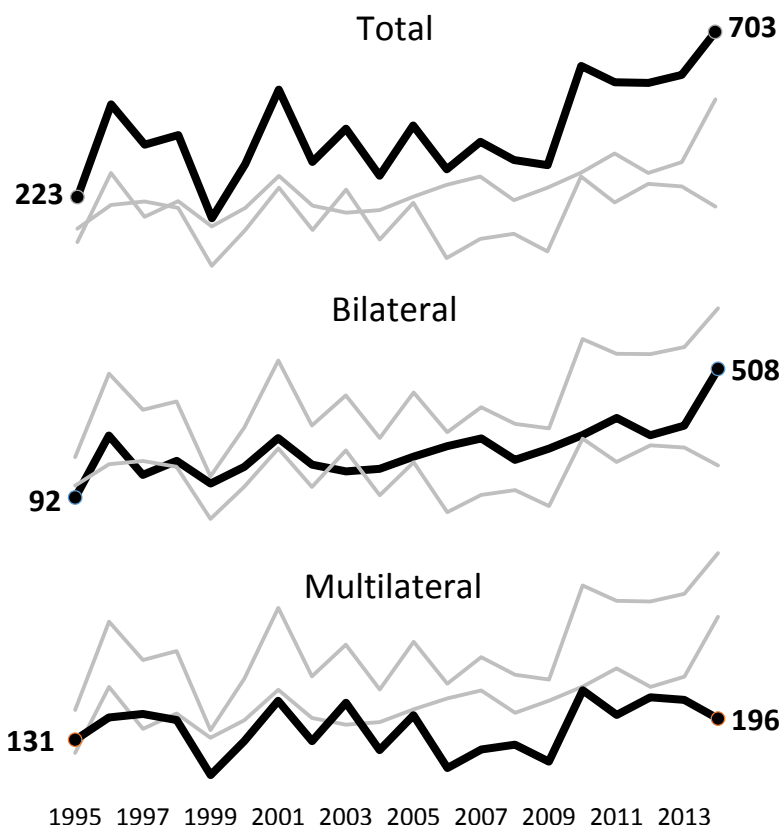


Analyzing Fig.3A based on the principles of data visualization:

- **P1. Show data:** Any single trend is obscured because data markers make it difficult to follow any single series.
- **P2. Reduce the clutter:** there are horizontal gridlines.
- **P3. Integrate the text and the chart:** the legend is located far from the data and the order of the legend does not match the order of the lines.

Fig.3B: Development of Laos' ODA inflows by bilateral donors and multilateral institutions, 1995-2014

(million US\$ in 2014) (Redesigned chart)

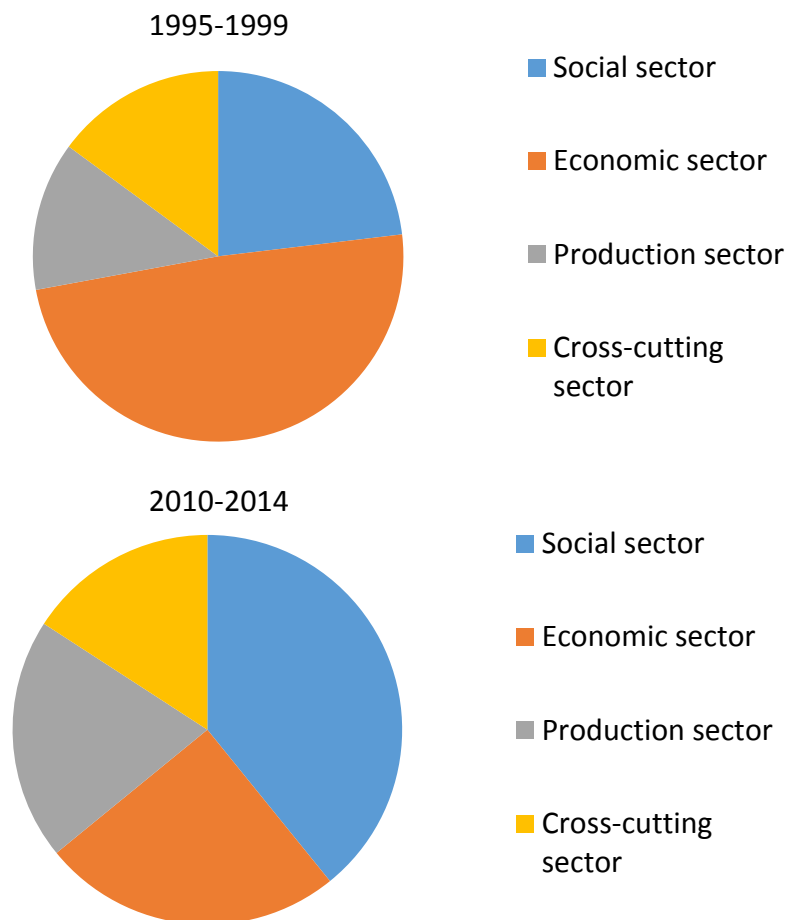


Redesigned chart to emphasize the trends over time:

- **P1. Show data:** split information into three smaller charts to highlight the information in each line within the context of all the data.
- **P2. Reduce the clutter:** remove horizontal gridlines.
- **P3. Integrate the text and the chart:** use a data label at either end of the main line.

Key message: ODA inflows to Laos over the period 1995-2014 show an upward trend, which is mainly driven by the rapid increase in bilateral ODA.

Fig.4A: Structure of Laos' ODA inflows by sectors, 1995-1999 and 2010-2014 (million US\$ in 2014)



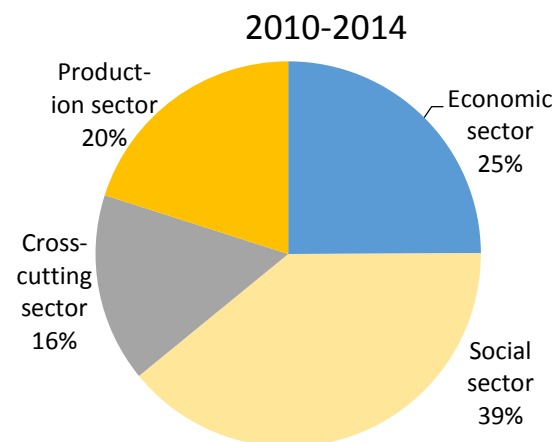
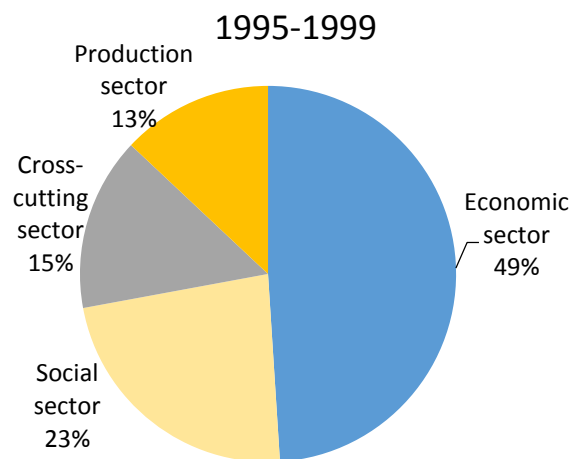
Analyzing Fig.4A based on the principles of data visualization:

- **P1. Show data:** the order of the segments is not positioned so that the largest starts at the 12 o'clock position.
- **P3. Integrate the text and the chart:** difficult to match color of segments with their respective legends.

Note: ODA for all sectors was US\$281 million in 1995-1999 and US\$576 in 2010-2014

Fig.4B: Structure of Laos' ODA inflows by sectors, 1995-1999 and 2010-2014

(million US\$ in 2014)



Redesigned chart to emphasize parts to whole:

- **P1. Show data:** arrange the order of segments from the largest to smallest one.
- **P3. Integrate the text and the chart:** add labels that integrate the data.

Key message: The structure of ODA inflows to Laos in 1995-1999 is different from that in 2010-2014. In 1995-1999, ODA was concentrated in economic sector (49% of total ODA), followed by social sector (23%). In 2010-2014, ODA was concentrated in social sector (39%), followed by economic sector (25%).

Note: ODA for all sectors was US\$281 million in 1995-1999 and US\$576 in 2010-2014

Exercises on data visualization

1. **Use Horizontal Bar Chart to show the ranking of the top 10 ODA donors for Laos in 2000 and 2014** (data in worksheet 'DONOR')
 - a) Sort data from largest to smallest
 - b) Keep the top 10 donor countries
 - c) Sort data from smallest to largest
 - d) Plot the horizontal bar chart and format it as Fig.1B
 - e) Is there any change in the ranking of donors between 2000 and 2014?

Exercises on data visualization

- 2. Use Pie Chart to show the structure of ODA in specific sector for 2000 and 2014 (data in worksheet 'SECTOR')**
- a) Sort ODA data from largest to smallest
 - b) Plot the pie chart and format it as Fig.4B
 - c) Is there any change in the structure of ODA between 2000 and 2014?

Conclusion

- Effective visualizations show the data to tell the story, reduce clutter to keep the focus on the important points, and integrate the text with the charts to transfer information efficiently.
- To create effective visualizations, consider the needs of target audience how the numbers, facts, or stories will help them understand your ideas and arguments.

Thank You

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