

Appendix 3: Industry cluster forecast

Many recent economic development efforts in this region and others have referred to the concept of economic clusters as an organizing principle. Definitions of clusters abound, but the most accepted definition is offered by Michael Porter, who is often identified as having originally coined the term:

“A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The geographic scope of clusters ranges from a region, a state, or even a single city to span nearby or neighboring countries... The geographic scope of a cluster relates to the distance over which informational, transactional, incentive, and other efficiencies occur.” (Porter, 2000)

Frequently-cited examples of clusters include information technology in California’s Silicon Valley, biopharmaceuticals in the Research Triangle in North Carolina, the garment district in New York City, insurance in Hartford, Connecticut, analytical instruments in Oregon, and the winemaking in northern and central California. Porter (2000) states that, in order for the concept of a cluster to be useful, it must not be defined too broadly (e.g. “manufacturing, services, consumer goods, or high tech”) or narrowly equating a cluster with a single industry.

Several stakeholders and representatives of local jurisdictions have suggested that the concept of clusters should be incorporated into the UGR’s analysis. The concept of a cluster makes intuitive sense, but it is also a concept that has its share of detractors, criticized for being too vague to be of use for analysis purposes. Because it can be a vague concept, some writers (Martin & Sunley, 2002) suggest that it be used carefully within a policy context. With that caution in mind, this Draft UGR presents the employment forecast for five of our region’s commonly-recognized clusters, but does not extrapolate the forecast into a demand for capacity (specific limitations of a cluster approach to a forecast are listed later in this document).

Cluster definitions

The Portland metropolitan region does not have an agreed upon economic development strategy, nor has Metro been asked to formulate one. With that caveat, this analysis uses the Portland Development Commission’s (PDC) list of five existing clusters:

- Active wear and outdoor gear
- Advanced manufacturing
- Bioscience
- Cleantech
- Software

Other cluster definitions could be used for this analysis. Though it also has limitation, this analysis uses the PDC’s definition of the above clusters. Those definitions are given below and include the NAICS codes that PDC has associated with each cluster. The following information is taken from a series of “Cluster Profiles” published by PDC and available on their website at http://www.pdc.us/pubs/inv_detail.asp?id=932&ty=46

Active wear and outdoor gear includes two general categories:

Activewear and Outdoor Gear: Companies that design, manufacture, and/or market sporting and athletic apparel and camping, hiking and outdoor gear.

(NAICS: 315, 33992, 3162, 5414, 42391, 4243)

Bicycle Frame Building: Companies that design, manufacture, and/or market bicycles and bicycle accessories.

(NAICS: 336991)

Example companies: Nike, Icebreaker, Nau, END Outdoor, Adidas, Keen, Yakima, Nautilus, Ziba, Columbia, S Group

Advanced manufacturing

This cluster includes companies that produce or shape metal into parts or machinery; companies that manufacture equipment for transportation purposes; companies that manufacture computer, electronic and semiconductor components. PDC's cluster definition excludes wood product manufacturing, food manufacturing and paper manufacturing.

(NAICS: 331, 332, 333, 334, 336)

Example companies: Precision Castparts, Intel, Tektronix, Esco, Blount, Sapa Profiles, Columbia Steel Casting, Evraz, Xerox

Bioscience

This cluster is comprised of companies that manipulate living cells and their components to make therapeutic drugs; genetically modified plants; and medical diagnostic tools. The regional cluster is anchored by Oregon Health and Sciences University (OHSU) and Genentech in Hillsboro. However, the Portland metropolitan region's niche within this industry is in the development of medical devices, rather than in medicinal drug development.

(NAICS: 3254, 3391, 42345, 54171, 62151)

Example companies: FEI, Acrymed/I-Flow, Welch Allyn, Biotronik, Precision Wire, Components, AVI Biopharma, Acumed, Genentech, HemCon, Virogenomics

Cleantech includes four general categories, however only two of them are identifiable by NAICS codes.

Alternative energy: Companies that research, develop, or operate alternative energy facilities, such as biomass, ethanol, solar and wind power generation facilities.

(NAICS: 221119, 333611)

Environmental consultation and remediation services: Companies that provide environmental engineering and consulting; environmental testing and analysis; and remediation services.

(NAICS: 54162, 541330, 562111, 562910)

Green Buildings: Companies that design, develop, or provide general contracting, remodeling and renovation services for residential, industrial or commercial buildings and use the LEED or comparable certification standards to ensure the buildings meet energy efficiency and environmental impact reduction standards. (No NAICS codes associated)

Energy Efficiency: Companies that promote weatherization and other energy efficiency investments, policies, and infrastructure. This cluster is growing rapidly in the Portland region. (No NAICS codes associated)

In addition, PDC includes companies that recycle industrial waste (NAICS: 42393).

Example companies: CH2M Hill, PECl, Solaicx, SERA Architects, Gerding Edlen, Vestas, David Evans and Associates, SolarWorld, Brightworks Northwest, Suzlon Wind Energy Co., Enxco, Energy Trust of Oregon

Software

This cluster includes companies that design, develop, market, and support systems and application software used in personal computers, servers, embedded systems, and mobile devices.

(NAICS: 5112, 518, 5415)

Example companies: Jive Software, Webtrends, Survey Monkey, Vidoop, Tripwire, OpenSourcery, Sage Software, eRoi, AboutUs, Coaxis, Imagebuilder, i-OP

Existing cluster employer locations

As shown in Table 1, the geographic distribution of existing (year 2006) cluster employment (cluster firms identified by PDC) throughout the region varies from one cluster to another. These market subareas are defined in the UGR. Employment in the Activewear cluster is concentrated in the Inner ring with much smaller proportions of employment located in the Central and Outer areas. Advanced Manufacturing and Bioscience are concentrated in the Outer ring with some employment in the Inner ring and very little in the Central area of the city. By contrast, the Central City has the highest proportion of Cleantech employment with diminishing Cleantech proportions located in the Inner and Outer rings. Software employment is fairly evenly distributed among the three areas.

Table 1: Distribution of existing (year 2006) cluster employment in the Portland metropolitan region by market subarea

Cluster	Central	Inner	Outer	In Metro UGB
Activewear	12%	71%	15%	98%
Advanced Manufacturing	2%	37%	60%	98%
Bioscience	14%	32%	53%	99%
Cleantech	44%	35%	17%	97%
Software	33%	34%	32%	99%

Limitations of a cluster approach to the forecast

Global Insight data are the basis for the region's employment forecast. Because the Global Insight data use NAICS codes, it is also necessary to conduct this cluster forecast using NAICS codes. However, NAICS codes present some challenges for identifying the industry or cluster with which to associate an individual firm. This is because NAICS codes are self-reported and necessarily are a simplification of actual business activities. As Porter (Porter, 2000) states, "cluster boundaries rarely conform to standard industrial classification systems."

This issue is illustrated quite clearly by an examination of the examples of cluster employers provided by PDC. At least one third of the example companies listed by the PDC do not identify themselves under any of the NAICS codes that PDC lists as defining the cluster. Many of these firms are identified with NAICS code 551114 (Corporate, Subsidiary and Regional Managing Offices). Though the forecast does not predict the growth of individual firms, the unclear relationship between NAICS codes and clusters presents a complication for conducting a cluster forecast since historic employment data, by NAICS code, are used as a starting point. More details about the use of historic employment data in this analysis are included in the methods section, below.

Given the above challenges of linking NAICS codes to clusters, this cluster forecast should be interpreted with those caveats in mind. It should also be remembered that the original employment forecast results remain the same. The cluster analysis simply provides a way of organizing the forecast data in a format that resonates with some readers.

Cluster forecast methods

To partially alleviate the mismatch between NAICS codes and clusters, this analysis includes the PDC example companies that identified themselves under NAICS code 551114 (Corporate, Subsidiary and Regional Managing Offices) despite the fact that this NAICS code does not appear in the PDC cluster definitions. However, example companies that identified themselves under other codes that are not listed in PDC's cluster definitions were not included. This exclusion was necessary to create a consistent approach. Companies that are listed as NAICS code 551114, but that are not listed by the PDC as cluster examples were also not included in this analysis (including all of them would make cluster definitions even more fuzzy). The resulting cluster employment data for the year 2006 is shown in Table 2.

Table 2: Cluster employment for the year 2006 for the three-county region (ES202 data)

Cluster	Number of firms	Number of employees
Activewear	542	10,361
Advanced Manufacturing	1,116	64,917
Bioscience	376	5,754
Cleantech	704	9,593
Software	1,478	14,803
Total	4,216	105,428

Steps to forecast employment for the identified clusters:

- (1) Categorize identified cluster NAICS codes in sectors (e.g. wholesale or information). Each cluster is divided among two to four sectors.
- (2) Determine what proportion of each sector's employment should be attributed to each cluster using the 2006 employment data. The proportions of sector employment by cluster for the 3-county area are shown in Table 3.

Table 3: Year 2006 proportions of sector employment by cluster in 3-county area (from 2006 ES202 data)

NAICS	Sector	Sector employment (3-county)	Cluster				
			Active Wear	Adv Mfg	Bioscience	Cleantech	Software
334	Mfg – High tech	33,539		100.0%			
31,32,33 (except 334)	Mfg – Non-high tech	69,056	1.7%	45.4%	3.2%		
42	Wholesale	49,178	13.9%		1.4%	2.3%	
51	Information	20,019					42.9%
54	Professional Services	43,273	2.8%		4.2%	15.4%	14.4%
55	Management	20,745	5.6%	0.3%		1.2%	
56	Admin, Waste	52,938				3.0%	
62	Health & Social Services	84,801			1.2%		
	Total (all sectors)	808,389	1.3%	8.0%	0.7%	1.2%	1.8%

(3) The original employment forecast is for the 7-county region, while the cluster data is for the 3-county area. In order to align the geographies of the employment forecast and the 2006 cluster data, both datasets have been scaled down to the UGB for the rest of this analysis. Historic 3-county employment data indicates that the UGB capture rate for cluster employment is between 97 and 99 percent (depending on the cluster). The proportions of sector employment by cluster for the Metro UGB are shown in Table 4.

Table 4: Year 2006 proportions of sector employment by cluster in UGB (from 2006 ES202 data)

NAICS	Sector	Sector Employment (UGB)	Active Wear	Adv Mfg	Bioscience	Cleantech	Software
334	Mfg – High tech	33,246		100.0%			
31,32,33 (except 334)	Mfg – Non-high tech	64,872	1.7%	47.4%	3.3%		
42	Wholesale	47,675	14.0%		1.4%	2.3%	
51	Information	19,449					43.7%
54	Professional Services	42,596	2.8%		4.2%	15.1%	14.5%
55	Management	20,686	5.5%	0.3%		1.2%	
56	Admin, Waste	51,554				3.0%	
62	Health & Social Services	83,491			1.2%		
	Total (all sectors)	772,140	1.3%	8.2%	0.7%	1.2%	1.9%

The 7-county high and low growth employment projections were narrowed to the UGB using sector specific UGB capture rates derived from modeled scenarios (same capture rates by sector as reported elsewhere in this UGR). These high and low employment forecasts are shown in Tables 5 and 6.

Table 5: High growth UGB employment forecast (thousands of employees)

NAICS	UGB Capture Rates		UGB Employment Projections (thousands)				
	2010-2015	2015-2030	2010	2015	2020	2025	2030
11, 21	0.0%	0.0%	0.0	0.0	0.0	0.0	0.0
23	68.6%	73.3%	53.4	58.3	68.7	76.3	85.9
334	80.6%	68.6%	31.6	35.1	31.9	33.6	35.4
31,32,33 (except 334)	86.7%	82.2%	85.4	91.8	89.6	90.8	91.6
42	78.0%	74.6%	47.9	52.9	55.3	59.6	64.1
44,45	82.0%	86.5%	98.9	108.5	117.9	122.9	129.3
22, 48,49	82.8%	70.8%	33.8	40.0	37.5	40.1	43.0
51	92.0%	85.7%	24.8	29.0	31.3	35.7	40.3
52	73.6%	85.7%	35.4	41.7	53.3	57.9	62.1
53	84.0%	84.9%	23.9	26.5	29.4	31.9	34.5
54	92.0%	84.9%	55.9	66.1	69.5	77.1	85.1
55	84.2%	81.0%	22.6	28.2	32.2	37.2	42.7
56	85.0%	81.2%	65.5	81.0	88.4	98.4	107.8
61	87.3%	81.2%	22.6	25.3	27.0	30.4	33.8
62	82.1%	81.0%	98.4	117.9	138.1	157.4	178.0
71	78.9%	74.6%	12.0	13.3	14.1	15.6	17.1
72	83.5%	81.0%	73.5	81.9	87.5	94.9	102.4
81	82.0%	73.9%	34.3	42.0	44.5	50.4	56.2
92	82.3%	78.1%	132.8	135.8	137.1	145.0	152.6
Total			952.5	1,075.3	1,153.4	1,255.5	1,361.9

Table 6: Low growth UGB employment forecast (thousands of employees)

NAICS	UGB Capture Rates		UGB Employment Projections (thousands)				
	2010-2015	2015-2030	2010	2015	2020	2025	2030
11, 21	0.0%	0.0%	0.0	0.0	0.0	0.0	0.0
23	68.6%	73.4%	30.1	31.3	32.9	31.8	30.3
334	80.6%	70.0%	20.1	21.2	19.2	19.8	20.4
31,32,33 (except 334)	86.7%	84.3%	61.9	63.0	60.6	59.6	58.6
42	78.0%	77.0%	43.5	48.2	52.1	56.2	60.3
44,45	82.0%	87.5%	83.0	88.4	94.6	96.5	100.3
22, 48,49	82.8%	70.6%	29.9	35.7	33.4	35.6	38.0
51	92.0%	86.4%	17.6	18.9	19.7	22.0	24.5
52	73.6%	86.4%	30.5	35.1	45.0	48.8	52.6
53	84.0%	85.8%	20.2	22.0	24.7	26.7	28.8
54	92.0%	85.8%	44.1	50.1	52.8	58.6	65.0
55	84.2%	83.9%	14.8	16.3	17.9	19.8	22.4
56	85.0%	82.1%	38.2	41.8	42.4	44.7	46.9
61	87.3%	82.1%	18.9	20.9	22.3	24.7	27.0
62	82.1%	83.9%	88.2	104.0	125.7	142.4	160.1
71	78.9%	77.0%	9.6	10.6	11.7	12.9	14.1
72	83.5%	83.9%	69.0	76.9	85.1	92.2	99.4
81	82.0%	74.4%	25.0	29.2	30.7	34.6	38.5
92	82.3%	79.8%	122.6	124.4	127.6	134.7	141.4
Total			767.5	838.0	898.3	961.7	1,028.8

Cluster forecast results

The UGB employment forecasts were allocated to clusters using the proportions in Table 4. These forecasts only represent the NAICS codes that comprise the identified clusters. There are additional jobs in other NAICS codes in the full forecast. The high growth employment forecast is shown by sector in Table 7 and by cluster in Table 8 and Figure 1.

Table 7: High growth cluster employment forecast for UGB by sector (thousands of employees)

NAICS	Sector	Cluster	Share of Sector	Number of employees (thousands)				
				2010	2015	2020	2025	2030
334	Mfg – High tech	Adv Mfg	100.0%	31.6	35.1	31.9	33.6	35.4
31,32,33 (except 334)	Mfg – non-high tech	Activewear	1.7%	1.5	1.6	1.6	1.6	1.6
		Adv Mfg	47.4%	40.4	43.5	42.4	43.0	43.4
		Bioscience	3.3%	2.9	3.1	3.0	3.0	3.1
42	Wholesale	Activewear	14.0%	6.7	7.4	7.7	8.4	9.0
		Bioscience	1.4%	0.7	0.8	0.8	0.9	0.9
		Cleantech	2.3%	1.1	1.2	1.3	1.4	1.5
51	Information	Software	43.7%	10.8	12.7	13.7	15.6	17.6
54	Professional Services	Activewear	2.8%	1.6	1.9	2.0	2.2	2.4
		Bioscience	4.2%	2.3	2.8	2.9	3.2	3.6
		Cleantech	15.1%	8.5	10.0	10.5	11.7	12.9
		Software	14.5%	8.1	9.6	10.1	11.2	12.3
55	Management	Activewear	5.5%	1.2	1.6	1.8	2.1	2.4
		Adv Mfg	0.3%	0.1	0.1	0.1	0.1	0.1
		Cleantech	1.2%	0.3	0.3	0.4	0.4	0.5
56	Admin, Waste	Cleantech	3.0%	1.9	2.4	2.6	2.9	3.2
62	Health & Social Services	Bioscience	1.2%	1.2	1.5	1.7	1.9	2.2
	Total			120.9	135.4	134.4	143.1	152.0

Table 8: High growth cluster employment forecast for UGB by cluster (thousands of employees)

Cluster	ES202 2006	2010	2015	2020	2025	2030
Activewear	10.4	11.0	12.4	13.0	14.2	15.3
Adv Mfg	64.9	72.0	78.7	74.4	76.7	78.9
Bioscience	5.8	7.1	8.1	8.4	9.1	9.8
Cleantech	9.6	11.8	13.9	14.8	16.4	18.0
Software	14.8	18.9	22.3	23.8	26.8	29.9
All Clusters	105.4	120.9	135.4	134.4	143.1	152.0
Cluster share of all employment	13%	13%	13%	12%	11%	11%

Under the high growth forecast, cluster employment represents a decreasing share of employment in the UGB between the years 2006 and 2030. The low growth employment forecast is shown by sector in Table 9 and by cluster in Table 10 and Figure 2.

Table 9: Low growth cluster employment forecast for UGB by sector (thousands of employees)

NAICS	Sector	Cluster	Share of Sector	Number of employees (thousands)				
				2010	2015	2020	2025	2030
334	Mfg – High tech	Adv Mfg	100.0%	20.1	21.2	19.2	19.8	20.4
31,32,33 (except 334)	Mfg – non-high tech	Activewear	1.7%	1.1	1.1	1.1	1.0	1.0
		Adv Mfg	47.4%	29.3	29.8	28.7	28.2	27.8
		Bioscience	3.3%	2.1	2.1	2.0	2.0	2.0
42	Wholesale	Activewear	14.0%	6.1	6.8	7.3	7.9	8.5
		Bioscience	1.4%	0.6	0.7	0.8	0.8	0.9
		Cleantech	2.3%	1.0	1.1	1.2	1.3	1.4
51	Information	Software	43.7%	7.7	8.3	8.6	9.6	10.7
54	Professional Services	Activewear	2.8%	1.2	1.4	1.5	1.7	1.8
		Bioscience	4.2%	1.8	2.1	2.2	2.5	2.7
		Cleantech	15.1%	6.7	7.6	8.0	8.9	9.8
		Software	14.5%	6.4	7.3	7.6	8.5	9.4
55	Management	Activewear	5.5%	0.8	0.9	1.0	1.1	1.2
		Adv Mfg	0.3%	0.0	0.0	0.0	0.1	0.1
		Cleantech	1.2%	0.2	0.2	0.2	0.2	0.3
56	Admin, Waste	Cleantech	3.0%	1.1	1.2	1.3	1.3	1.4
62	Health & Social Services	Bioscience	1.2%	1.1	1.3	1.6	1.8	2.0
	Total			87.4	93.1	92.3	96.6	101.3

Table 10: Low growth cluster employment forecast for UGB by cluster (thousands of employees)

Cluster	ES202 2006	2010	2015	2020	2025	2030
Activewear	10.4	9.2	10.2	10.8	11.7	12.5
Adv Mfg	64.9	49.4	51.1	48.0	48.1	48.2
Bioscience	5.8	5.6	6.2	6.5	7.0	7.5
Cleantech	9.6	9.0	10.1	10.7	11.7	12.9
Software	14.8	14.1	15.5	16.3	18.1	20.1
All Clusters	105.4	87.4	93.1	92.3	96.6	101.3
Cluster share of all employment	13%	11%	11%	10%	10%	10%

Under the low growth forecast, cluster employment represents a decreasing share of employment in the UGB between the years 2006 and 2030.

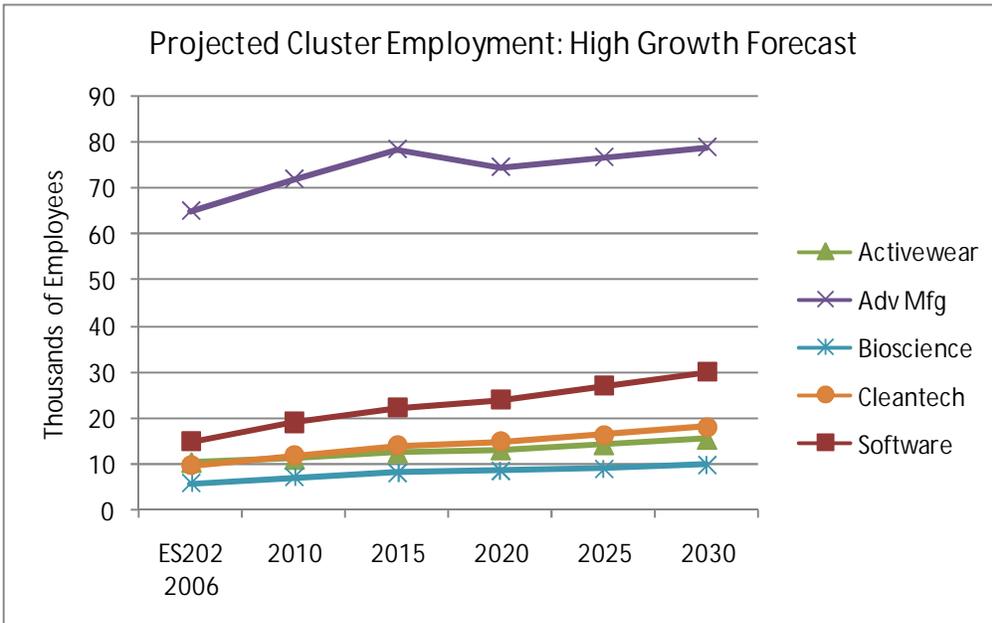


Figure 1: Projected cluster employment for UGB by cluster through 2030 (high and low growth forecasts)

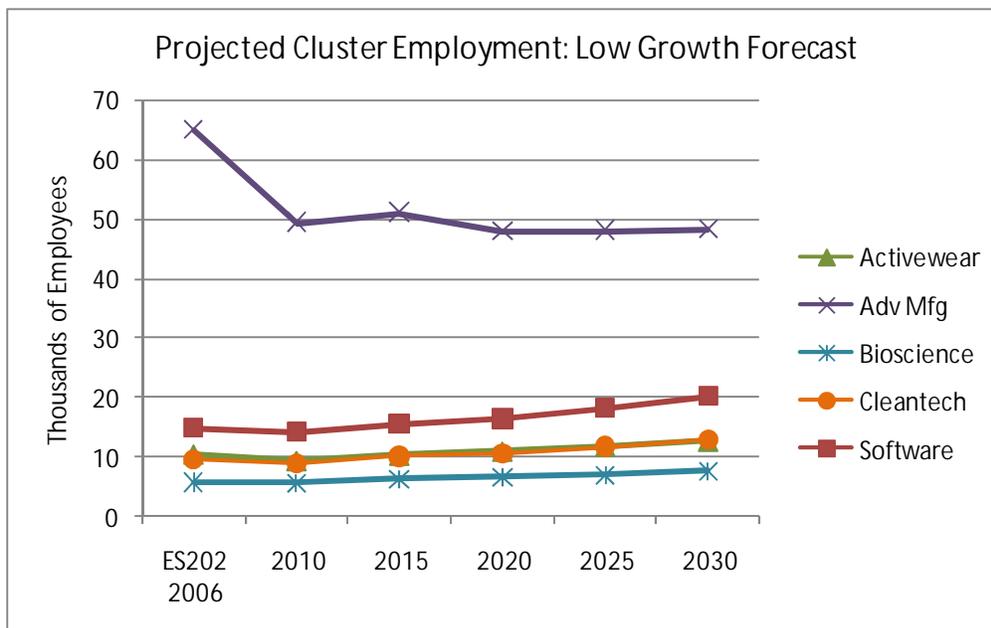


Figure 2: Projected cluster employment for UGB by cluster through 2030 (low growth forecast)

Under the high growth forecast, all five of the identified clusters would realize growth in employment by the year 2030. Under the low growth forecast, the Advanced Manufacturing cluster is forecasted to

suffer the most of the five clusters, with no recovery to 2010 employment levels by the year 2030. Under the low forecast, growth in the remaining four clusters is expected to occur, but at a slower rate than under the high growth forecast. By the year 2030, at both the high and low ends of the range, cluster employment is forecasted to comprise a smaller share of total employment in the Metro UGB than it did in 2006.