



Green Talent
Research Initiative

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In-state Employment Outcomes of Students Completing Green Degree Programs in New Jersey

A report of the New Jersey Department of
Labor and Workforce Development

Prepared by the John J. Heldrich Center for
Workforce Development

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Introduction

Green jobs, and green training, have captured the attention of policymakers and job seekers alike in recent years. As hope for green job growth has increased, federal, state, and local investments in green education also have grown. The United States Department of Labor allocated \$500 million in American Recovery and Reinvestment Act (ARRA) funding in 2009 to support green job training and while not all of this funding was distributed, states and educational institutions have also invested heavily in creating new green training and education programs.

In New Jersey, Heldrich Center researchers identified over 450 public and private green, credential-based education and training programs, including credit and noncredit programs that provide students with knowledge of sustainability, energy efficiency, and other green areas of knowledge. Given the state's dedication to encouraging the growth of green jobs and establishing a solid workforce base for this sector, it becomes critical for policy makers to understand the performance of the green educational programs, as well as the types of in-state jobs that graduates are filling. Despite the large and growing number of these programs however, little is known about the in-state employment outcomes for students who complete them.

This report provides information on the New Jersey employment experiences of more than 1,000 individuals who completed 56 green, credit-bearing degree and certificate programs in the state between 2007 and 2009, the most recent time period for which data were available. Employment outcomes are measured by two parameters: employment rates and quarterly income. Unfortunately, due to lags in data availability and the current lack of available data on most noncredit programs, it is not possible to evaluate the labor market outcomes of students in the majority of currently offered green programs, including those created as a result of ARRA funding. While the programs discussed here are not representative of the larger group of 450-plus programs, policymakers will be able to make more informed investments in green education and training going forward with data on the baseline employment outcomes of completers of more long-standing green education programs. This information can be used to understand how the completers of green programs have fared in the labor market in the past compared to completers of similar programs, so that there is a basis of comparison for future studies.

Program and Graduate Overview

This study examines the rate at which graduates of green programs (for which data on graduates were available) became employed in New Jersey,

Researchers identified over 450 public and private green education and training programs

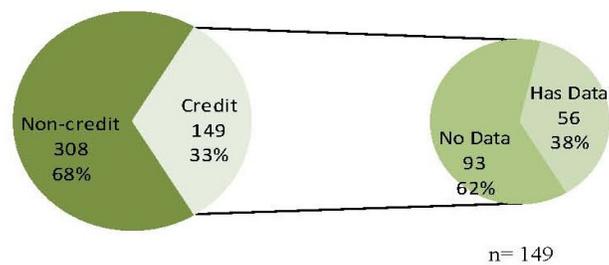


the difference in pre- and post-program wages for those ages 25 and over, and the types of industries that graduates who obtained work in New Jersey entered. Please note that the employment rate reflects those graduates who are employed in New Jersey four quarters after completing their program. Those who are not employed in the state are not necessarily unemployed. Students who matriculate into educational programs, those who obtain jobs outside of New Jersey, as well as those who remain unemployed or out of the workforce are all included in the count of graduates who are not included in the employment rate. The employment outcomes of graduates from the 56 programs included in this study are also compared to the outcomes of completers of similar programs in the state in order to determine the relative value of a green credit program versus the average for all programs (green and nongreen) in the same subject category. These subject categories correspond to the “2-digit level” of the Standard Classification of Instructional Programs (CIP) code taxonomy.

Profile of green programs with data on the employment outcomes of graduates

The sample of 56 green, credit, degree, and certificate programs included in this study is a subset of more than 450 green education and training programs identified in The Green Program Inventory conducted by the John J. Heldrich Center in 2011 through a contract with the New Jersey Department of Labor and Workforce Development. For more information on the characteristics of the larger group of 450 programs, please see *An Assessment of the Alignment of New Jersey’s Green Training and Education Programs With the Skill Needs of Employers*. Figure 1 below illustrates the portion of the larger inventory for which data on completer labor market outcomes were available. As indicated below, the 56 programs represent 12 percent of all programs in the inventory (including credit and noncredit programs) and 38percent of all credit programs in the inventory.

Figure 1. Proportion of all credit-based green education and training programs in New Jersey that have data available on program completers.





Credit degree programs identified in the Green Program Inventory include green degree majors, as well as green minors or tracks. A green degree major is defined as a collection of courses leading to a postsecondary degree with a "green" word or phrase in the degree title (sustainability, green building, environmental, agricultural, etc.) or that has major requirements with a strong green focus. A green minor or track is defined as a formal minor or degree track with a "green" word in the title (e.g. green building track within an architecture degree) or a strong green focus within required courses for the minor/track.

Figure 2, below, shows the breakdown of credit programs included in this report (those with data available on completers) compared to all green credit programs in the Green Program Inventory. The inner circle represents the 56 green credit programs discussed in this report. As shown in Figure 2, the sample of programs with data is weighted more heavily toward four-year degree and certificate programs than the overall inventory of credit programs (52% of the sample and 48% of all credit programs in the inventory), whereas a smaller proportion of programs in the sample are from community colleges (18% of programs in the sample and 20% in the overall inventory of credit programs). The proportion of graduate programs is roughly the same (30% vs. 32%).

The Green Program Inventory include green degree majors, minors or tracks

Figure 2. Breakdown of Credit Green Programs, All vs. Programs with Data

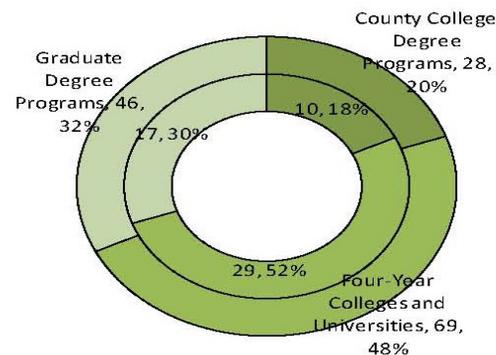


Figure 3, on the following page, lists 21 groups that contain a total of 56 individual programs included in this study. Among the 21 program groups, nine had more than 20 graduates in 2008. Comparative analysis in this report will focus only on these nine program groups due to the low numbers in the remaining groups, which make fair comparisons of performance less reliable. Groups of programs correspond with the Standard Classification of Instructional Programs (CIP) code taxonomy. See the notes below Figure 3 to see a more detailed explanation of the construction of these groups.



Figure 3. List of Green Programs Included in Analysis and Program Groups Used for Comparative Program Analysis

Program Groups (Based on CIP categories)	Number of Programs**	Whether or not All NJ Programs	2007 Cohort Number of Graduates	2008 Cohort Number of Graduates	Change in Graduate Numbers from 2007-2008	
Biological and Physical Sciences (Ramapo College, BA in Integrated Science Studies with Biology/ Environmental Studies Concentration)	1		3	1	-2	-67%
Environmental Control Technologies/Technicians, Other Heating, Ventilation, Air Conditioning and Refrigeration Engineering Technology/Technician	1	All	3	1	-2	-67%
Engineering Technology/Technician	1	All	7	2	-5	-71%
Atmospheric Sciences and Meteorology, Other (Rutgers: Ph.D. in Atmospheric Sciences)	1	All	1	3	2	200%
Agricultural/Biological Engineering and Bioengineering	3	All	9	5	-4	-44%
Energy Management and Systems Technology/ Technician	3	All	9	7	-2	-22%
Geography (Montclair State University: BA in Geography)	1		9	8	-1	-11%
Chemistry, General (Richard Stockton College: BS in Chemistry)	1		6	9	3	50%
Physical Sciences (Warren County Community College: AA in Science in General Science)	1		4	9	5	125%
Public Policy Analysis (NJIT: MA in Environmental Policy Studies)	1		6	10	4	67%
Agricultural Business and Management, General	2	All	19	11	-8	-42%
Engineering, General (Union County College: AA in Engineering/Environmental Science)	1		12	12	0	0%
Environmental/Environmental Health Engineering	6	All	19	21	2	11%
Chemical Engineering (Rowan University: BS in Chemical Engineering)	1		17	26	9	53%
Natural Resources Management and Policy	3	All	33	32	-1	-3%
Environmental Design/Architecture (Rutgers: BS in Environmental Planning and Design)	1	All	36	34	-2	-6%
Geology/Earth Science, General	9	All	52	44	-8	-15%
Environmental Science	9	All	74	52	-22	-30%
Social Sciences, Other (Rutgers University: BS in Environmental and Business Economics)	1		55	57	2	4%
Environmental Studies	8	All	88	88	0	0%
Engineering, Other (Stevens Institute of Technology: M.S. in Environmental Engineering)	1		51	74	23	45%
Total	56		513	506	7	1.4%

Note: Those in bold are single programs at individual institutions that have been identified as green programs by the program title or an examination of the content, but that fall within a detailed, 4-6 digit CIP code that is not identifiably green. The programs not in bold include graduates from all programs in the state that are part of detailed CIP codes that can be considered green by the CIP title – such as Agricultural Business and Management. Programs under the same Classification of Instructional Programs (CIP) but at different degree levels are counted separately. For example, Ph.D. and bachelor programs of Chemical Engineering are counted as two programs.

Profile of green program graduates

In order to compare how labor market outcomes may change over time, researchers collected information on two cohorts of graduates: those who graduated between the third quarter of 2007 and the second quarter of 2008 (2007 cohort); and those who graduated between the third quarter

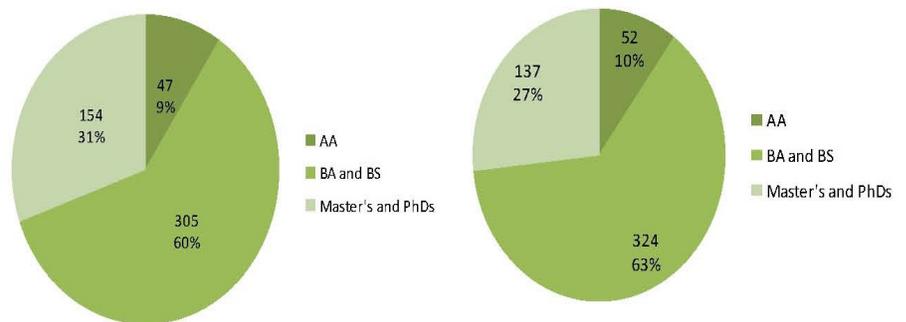


of 2008 and the second quarter of 2009 (2008 cohort). The second quarter of 2009 is the most recent time period for which data on completers were available. For both cohorts, New Jersey employment data in the fourth quarter before entering the programs and the fourth quarter after graduation were the most recent available. Wage data is calculated for the same periods, but only for those who were at least age 25 at the time of starting the program, so pre- and post-program wages can be fairly compared. Both the 2007 and 2008 cohorts are similarly sized. The 2007 cohort has 513 graduates in total, while the 2008 cohort has 506 graduates.

Key characteristics of the graduate sample include:

- a. **The 2008 cohort has a larger number of graduates with master’s and doctoral degrees than the 2007 cohort, fewer bachelor’s degree graduates, and about the same percentage of associate’s degree graduates.** Compared to the 2007 cohort, in the 2008 cohort the proportion of master’s and doctoral graduates increased by four percentage points, from 27 percent to 31 percent, while the proportion of bachelor’s graduates dropped three percentage points, from 63 percent to 60 percent. The proportion of graduates with associate degrees remained steady, with a slight decrease by one percentage point, from 10% to 9%. (See Figure 4 on the following page)

Figure 4. Proportion of Completers in the 2008 and 2007 Cohorts, by Degree Level



2008 Cohort N= 506

	2007		2008		Change from 2007 to 2008	
AA	52	10%	47	9%	-5	-10%
BA and BS	324	63%	305	60%	-19	-6%
Masters and PhDs	137	27%	154	30%	17	12%
Total in New Jersey	513	100%	506	100%	-7	-1%



The average employment rate for green credit programs is lower than for all graduates

b. Graduates are most highly concentrated in the following programs:

- Environmental Studies programs account for 17 percent of the 2007 and 2008 cohorts, respectively;
- The Master's program in Environmental Engineering at Stevens Institute of Technology (classified as Engineering, Others) produced 10 percent of the 2007 cohort and 15 percent of the 2008 cohort;
- The BS in Environmental and Business Economics at Rutgers University accounts for 11 percent of 2007 and 2008 cohorts, respectively;
- Environmental Science programs provide 14 percent of 2007 cohort and 10 percent of 2008 cohort; and
- Geology/Earth Science programs which account for 10% of 2007 graduates and nine percent of the 2008 cohort.

c. The 2008 cohort has a slightly higher proportion of females than the 2007 cohort. In 2008, 41 percent of the graduates are female, compared to 37 percent in the 2007 cohort. At the program level, only Environmental Studies has a larger proportion of female students than male students in both 2007 and 2008 cohorts.

d. The 2008 cohort is younger than the 2007 cohort. In the 2007 cohort, 51 percent of the students entered the programs at the age of 24 or below. In the 2008 cohort, this percentage increased by four percentage points to 55 percent. The 2008 cohort also had a larger proportion of young students (24 and below) at the postgraduate degree levels.

Key Findings: Employment Outcomes

Finding 1. In the aggregate, fewer graduates of green programs analyzed for this study, particularly those from green master's and doctoral programs, are employed in New Jersey than graduates of all credit programs in the state for which data were available. Wages for green program graduates are also lower than those for all credit program graduates in the 2007 and 2008 cohorts.

As indicated in Figure 5 on the following page, the in-state average employment rate for all 56 green credit programs for which data were available is 54 percent for both of the 2008 and the 2007 cohorts. This is lower than the in-state employment rate for all graduates in New Jersey-- 61 percent in 2007



and 63 percent in 2008. Especially at the master's and doctoral degree levels, the in-state employment rate of green programs is substantially lower than that of all New Jersey graduates. The employment rate is 36 percent in 2007 and 32 percent in 2008 for master's and doctoral green program graduates, lower than 60 percent for all programs combined at the same degree level.

Figure 5. Employment Outcomes Four Quarters after Graduation by Degree Type

		2007 Employment Rate	2008 Employment Rate
Green Programs	Total	54% (275/513)	54% (273/506)
	AA	71% (37/52)	64% (30/47)
	BA	58% (189/324)	63% (193/305)
	MA & PhD	36% (49/137)	32% (50/154)
All in New Jersey	Total	61%	63%
	AA	64%	66%
	BA	61%	62%
	MA & PhD	60%	60%

As indicated in Figure 6 below, the median quarterly income four quarters after graduation for 2007 green program graduates who were at least 25 years old at the time of entering the program was \$11,744, somewhat lower than the average of \$12,268 for all New Jersey credit program graduates (a difference of just over \$500). All types of graduates experienced a drop in income when comparing 2007 and 2008 graduates, likely due to the poor economy. The overall the gap nearly doubled between the average quarterly earnings of green graduates, \$10,562 for 2008 compared to all graduates, \$11,654 (a difference of over \$1,000).

**Figure 6. Quarterly Income Change by Degree Type for Graduates
25 Years and Older at the Time of Enrollment**

		2007			2008		
		Before	After	Change	Before	After	Change
Green Program	Total	\$5,818	\$11,744	102%	\$5,364	\$10,562	97%
	AA	\$5,682	\$9,407	66%	\$5,808	\$8,263	42%
	BA	\$3,445	\$9,533	177%	\$2,539	\$7,716	204%
	MA&PhD	\$11,836	\$16,301	38%	\$11,488	\$16,009	39%
All in New Jersey	Total	\$6,358	\$12,268	93%	\$5,658	\$11,654	106%
	AA	\$5,834	\$9,600	65%	\$5,435	\$9,316	71%
	BA	\$4,712	\$10,029	113%	\$4,028	\$9,180	128%
	MA&PhD	\$7,021	\$9,789	73%	\$5,821	\$9,394	86%



Finding 2. The picture of performance of green credit programs is more complicated when results for graduates of green programs are compared with results of all graduates in similar programs. While graduates of some green programs exceed average levels for all graduates in the same subject area on some measures, no green programs produced graduates who outperformed the subject area average in all employment outcome areas.

Figure 7 provides an at-a-glance overview of how the performance of graduates from green program groups with more than 20 graduates compares to performance of all graduates from programs in the same subject category (subject categories correspond to 2-digit CIP code categories). Figure 8 on the following page provides detailed performance information by program. As these figures demonstrate, some green programs produced graduate cohorts that outperformed the average for all graduates in their larger subject category, although none considerably outperformed the average across both cohorts with regard to both in-state employment rates and average quarterly wages four quarters after graduation.

Some green programs outperformed the average for all graduates in their subject category

Employment rate four quarters after graduation

Two programs, the Rutgers B.S. in Environmental Planning and Design and Geology / Earth Science programs had graduate cohorts in 2007 and 2008 that outperformed the average for all graduates in the subject category by more than five percentage points with regard to in-state employment four quarters after graduation. As indicated in Figures 8, nearly half (47%) of the 36 graduates from the Rutgers B.S. in Environmental Planning and Design in the 2007 cohort were employed in New Jersey four quarters after graduation, compared to just 40 percent of all graduates (green and nongreen in Architecture and Related Services programs). By 2008, this difference had widened from seven percentage points to twenty-two as over two-thirds (68%) of the 2008 graduates from the Rutgers B.S. in Environmental Planning and Design program were employed in New Jersey compared to less than half (46%) of all graduates in the Architecture and Related Services category. As a result, between 2007 and 2008, the in-state employment rate for graduates of the B.S. program increased by 22 percentage points compared to a 6 percentage point increase for all New Jersey graduates of Architecture and Related programs.

Figure 8 also shows that 62 percent of Geology / Earth Sciences 2007 graduates in New Jersey were employed in the state four quarters after graduation compared to just 52 percent of all graduates from Physical Sciences programs in the state, a ten percentage point difference. In 2008, this gap decreased only slightly from ten percentage points to nine as 57 percent of Geology / Earth Sciences were employed in the state four quarters after grad-



uation, compared to just 48 percent among all New Jersey graduates in the Physical Sciences. Between 2007 and 2008, the percentage point decrease in employment rate for Geology / Earth Sciences program graduates was similar to the percentage point decrease for all Physical Sciences graduates over the same period (5 percentage points for Geology / Earth Science graduates vs. 4 percentage points for all Physical Sciences program graduates).

Graduates from other green programs also had higher in-state employment rates four quarters after graduation than the average for their subject categories, but the effect was less stable over time. For example, in 2007, the employment rate for graduates of Environmental Studies programs was nearly equal to that of all graduates from programs in the Natural Resources and Conservation category, but in 2008 the Environmental Studies program graduates outperformed the subject category average in this regard. As noted in Figure 8, over three-quarters (77%) of 2008 Environmental Studies graduates were employed in New Jersey four quarters after graduation, compared to just over two-thirds (68%) of graduates from all programs in the Natural Resources and Conservation category. Graduates of the green B.S. program in Chemical Engineering at Rowan University experienced the opposite trend. In 2007, 47 percent of these graduates were employed in New Jersey four quarters after graduation compared to just 40 percent of all Engineering graduates. In 2008, only 31 percent of graduates of the B.S. in Chemical Engineering program at Rowan were employed in the state a year after graduation compared to 37 percent of all Engineering graduates in the state. It is possible that these changes indicate shifts in demand for particular types of graduates, but other factors such as student characteristics in particular cohorts or the relatively low numbers of total graduates in these programs, may also play a role in the change.



Figure 7: Summary of Comparison of Graduate Employment Outcomes for Green Program Groups Compared to All Programs in the Same Subject Category

Green Program Groups	In-state employment rate four quarters after graduation		Percentage change in in-state employment rate between 2007 and 2008	Average quarterly wages four quarters after graduation		Percentage change in post-program average quarterly wages between 2007 and 2008
	2007	2008		2007	2008	
Environmental Studies	—	↑	↑	↓	↓	—
Environmental Science	—	↓	↓	↑	↑	↑
Natural Resources Management and Policy	—	↓	↓	↓	↓	—
Environmental Design/Architecture (Rutgers: BS in Environmental Planning and Design)	↑	↑	↑	↓	↓	↓
Chemical Engineering (Rowan University: BS in Chemical Engineering)	↑	↓	↓	↓	↑	↑
Environmental/Environmental Health Engineering	—	—	↓	↑	↑	—
Engineering, Other (Stevens Institute of Technology: M.S. in Environmental Engineering)	↓	↓	—	↓	↑	↑
Geology/Earth Science, General	↑	↑	—	↓	↓	↓
Social Sciences, Other (Rutgers University: BS in Environmental and Business Economics)	—	—	—	↑	↓	↓

Note: green and red arrows signify that graduates of green program groups performed better or worse, respectively, than graduates of all programs in the same subject category by five percentage points or more for employment rate and percentage change in wages, or more than \$500 in average quarterly wages four quarters after graduation. Blue dashes signify no major difference between green program graduate performance and performance of all graduates in a subject area as indicated by differences that fall within the range of plus or minus five percentage points or \$500 in average quarterly wages. As in earlier tables, programs in bold show results for graduates of a particular green program, while groups not in bold include graduates from all programs in the state within that green CIP category.



Figure 8. Detailed Employment Outcome Comparison by Program and Subject Category for 2007 and 2008 New Jersey Graduate Cohorts

	2007 Cohort Quarterly Income 4 Quarters after Graduation	2008 Cohort Quarterly Income 4 Quarters after Graduation	Difference in income between the 2007 and 2008 cohorts	2007 Cohort Employment 4 Quarters after Graduation	2008 Cohort Employment 4 Quarters after Graduation
Environmental Studies	\$7,995	\$5,445	-32%	57%	77%
Environmental Science	\$9,970	\$9,780	-2%	55%	58%
Natural Resources Management and Policy	\$5,949	\$4,314	-27%	55%	59%
Natural Resources and Conservation	\$8,792	\$6,356	-28%	56%	68%
Environmental Design/Architecture (Rutgers: B.S. in Environmental Planning and Design)	\$8,467	\$6,051	-29%	47%	68%
Architecture and Related Services	\$9,318	\$7,736	-17%	40%	46%
Chemical Engineering (Rowan University: B.S. in Chemical Engineering)	\$12,445	\$14,037	13%	47%	31%
Environmental/Environmental Health Engineering	\$17,590	\$16,009	-9%	42%	33%
Engineering, Other (Stevens Institute of Technology: M.S. in Environmental Engineering)	\$7,347	\$23,567	221%	27%	22%
Engineering	\$14,470	\$12,862	-11%	40%	37%
Geology/Earth Science, General	\$8,641	\$5,461	-37%	62%	57%
Physical Sciences	\$8,626	\$6,652	-23%	52%	48%
Social Sciences, Other (Rutgers University: B.S. in Environmental and Business Economics)	\$9,236	\$5,365	-42%	60%	56%
Social Sciences	\$6,720	\$6,238	-7%	55%	55%

Note: As in earlier tables, programs in bold show results for graduates of a particular green program, while groups not in bold include graduates from all programs in the state within that green CIP category. Grey-shaded areas represent results for all graduates from green and non-green programs within the larger subject category (2-digit CIP code category).

Average wages four quarters after graduation

Graduates employed in New Jersey from both the 2007 and 2008 cohorts from Environmental Science and Environmental / Environmental Health Engineering programs earned higher post-program wages than graduates of all programs in the same subject categories. For the 2007 cohort, employed graduates of Environmental Science programs earned only \$1,178 more, on average, four quarters after graduation than graduates of all programs in the same subject category. By 2008, the difference for these green programs increased to \$3,424. Environmental Science program graduates who were employed also outperformed the average for all New Jersey graduates in Natural Resources and Conservation when comparing average post-program wages between 2007 and 2008 cohorts. While average quarterly wages four quarters after graduation dropped by two percent when comparing the 2007 and 2008 cohorts for Environmental Science, this is a smaller decrease than that experienced by employed graduates of all programs in the category, which dropped by 29 percent over the period. Graduates of Environmental / Environmental Health Engineering programs performed about the same in this regard when compared to all Engineering graduates in the state.



Employed 2007 graduates of the Rutgers B.S. program in Environmental and Business Economics earned over \$2,500 more per year after graduation than all Social Science program graduates in the state but, by 2008, employed graduates of this program earned \$873 less, on average, than all Social Science graduates who held jobs in the state four quarters after graduation. In 2008, employed graduates from two additional programs outperformed the average for their subject categories with regard to post-program average quarterly wages, including the B.S. in Chemical Engineering at Rowan University and the M.S. in Environmental Engineering at Stevens Institute of Technology. Both of these programs experienced an increase in average quarterly wages four quarters after graduation when comparing 2007 and 2008 employed graduate cohorts. Post-program average quarterly wages fell between 2007 and 2008 for graduates of nearly all other green programs and all programs in corresponding broad subject categories. In 2007, M.S. in Environmental Engineering graduates earned an average quarterly wage of \$7,347 four quarters after graduation, while graduates in the 2008 cohort earned an average of \$23,568, an increase of 221 percent. Similarly, 2008 graduates from B.S. in Chemical Engineering at Rowan University earned 13 percent more than graduates from the 2007 cohort, increasing from \$12,445 to \$14,037.

Graduates of green programs consistently experienced wage gains from pre-program averages

On the other hand, employed 2008 graduates of the B.S. in Environmental and Business Economics at Rutgers earned 42 percent less in average quarterly wages four quarters after graduation than the 2007 cohort. Post-program wages for all Social Sciences programs dropped only seven percent when comparing 2008 to 2007 graduates. Post-program average quarterly wages for employed graduates of the B.S. in Environmental Planning and Design program at Rutgers decreased by 29 percent from 2007 to 2008. In contrast, there was a decrease of just 17 percent among both of these cohorts for all Architecture and Related Services programs over the same period. Similarly, average quarterly wages four quarters after graduation decreased by 37 percent when comparing 2007 and 2008 cohorts of employed graduates of Geology / Earth Science programs. Meanwhile graduates of all Physical Sciences programs experienced a drop of only 23 percent between these two cohorts.

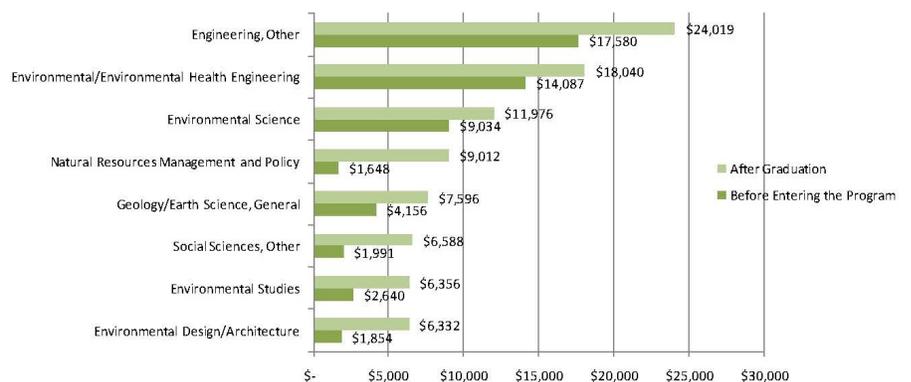
Finding 3. While not always outperforming the average for all graduates in the state or all graduates in similar programs, graduates of green programs who were 25 years old or older at the time of enrollment and who were employed four quarters after graduation, consistently experienced wage gains when pre- and post-program average quarterly earnings were compared. In fact, employed graduates of several green programs saw significant boosts in income one year after graduation compared to four quarters before.



As noted by Figure 9 below, the average quarterly income for all employed graduates who entered green programs when they were age 25 or over and who were employed a year after graduation was higher than these graduates had earned four quarters prior to entering the programs. Younger employed graduates were not included in this comparison because these younger enrollees are less likely to have been employed or to have worked full-time a year prior to enrollment. Comparing only the results of employed graduates who were older at the time they began the green program, therefore, provides a more accurate picture of probable program effects on post-program wages. Please note that this limited comparison means that the average quarterly income numbers four quarters after graduation are different in Table 9 from those in Figure 8, which include all students regardless of their ages.

Employed graduates 25 or older at the time of entry into Natural Resources Management and Policy, Environmental Design/Architecture, and Social Science experienced the largest increase in average quarterly wages pre- and post-program, respectively rising 447, 241, and 231 percent. Graduates meeting these criteria from Engineering, Other, Environmental / Environmental Health Engineering, and Environmental Science had the highest earnings among all programs before training and their incomes increased. Graduates from Engineering, Other, earned a quarterly income of \$17,580 before training, which went up to \$24,019 after training, a 37 percent increase. Graduates from Environmental Science earned a quarterly income of \$9,034 before training, a figure that increased by a third to \$11,976 when examining average wages four quarters after graduation. Graduates from Environmental / Environmental Health Engineering earned \$14,087 before training, while their average quarterly income went up 28 percent to \$18,040 four quarters after graduation.

Figure 9. Quarterly Income Comparison before and after graduation, Four Quarters after Graduation for the 2008 Cohort





Finding 4. Green program graduates who were employed in New Jersey one year after graduation held jobs that are dispersed across multiple industries without obvious concentration. It is difficult to determine if graduates obtained work in green jobs or green industries.

As shown in Figure 10, graduates from the 2008 cohort who were employed in New Jersey four quarters after graduation, found employment largely in the following industries: Educational Services (seven percent of all green-program graduates); Professional, Scientific, and Technical Services (six percent); and Healthcare and Social Assistance (2.5 percent). But, these broad industries only accounted for the employment of 16 percent of all employed graduates. The remainder were dispersed among other industries.

Only a few green program groups show concentrations of graduates employed in particular industries: (a) 14 percent of the graduates from the Environmental Engineering program at Stevens were employed four quarters after graduation in New Jersey's Pharmaceutical Preparation Manufacturing (a sub-industry of Manufacturing); (b) 15 percent of graduates from Environmental Design/Architecture were employed in New Jersey's Landscaping services (a sub-industry of Administrative and Support and Waste Management and Remediation Services); and, (c) 10 percent of graduates from Environmental Studies were employed in New Jersey's Educational Services industry. Employment patterns disperse for other green programs without obvious concentration.

Green jobs and green industries are difficult to define using standardized employment data, none of the industry areas in which green program graduates were employed in significant numbers is part of the New Jersey Department of Labor's list of potentially "green" industries. No occupation-level data on graduate employment was available for this study, making it even more difficult to determine if employed green program graduates were working in green jobs in the state.



Figure 10. Industries of Employment for Green Program Graduates

2-Digit Industries	Educational Services	Professional, Scientific, and Technical Services	Healthcare and Social Assistance	Accommodation and Food Services	Manufacturing	Administrative and Support and Waste Management and Remediation Services	Finance and Insurance	Utilities
Programs								
Chemical Engineering, Rowan University		1						2
Engineering, Other (M.S. in Environmental Engineering, Stevens Institute)					10			
B.S. Environmental Design/Architecture, Rutgers University	2	2				5		
Environmental Science	4	8						
Environmental Studies	9							
Environmental/ Environmental Health Engineering	1	1					1	
Geology/Earth Science, General	8	2						
Natural Resources Management and Policy		2						
Social Sciences, Other B.S. Environmental and Business Economics, Rutgers University				3			4	
Grand Total (Numbers for the nine programs do not add up to Grand Total because the total number includes all other green programs, as well)	37	29	13	11	10	8	5	7



Conclusions

With regard both to in-state employment rates and average quarterly wages one year after graduation, graduates of the 56 credit-bearing, green postsecondary education programs examined in this study did not consistently outperform graduates of all such programs in New Jersey nor all graduates of programs in the same subject categories. There are few identifiable patterns in the types of industries in New Jersey that employed green program graduates a year after graduation.

All graduates who were employed in the state one year after graduation and who were at least 25 years old at the time of program entry experienced a rise in average quarterly wages when compared to pre-program wages. In addition, graduates from some green program groups did outperform the average for all graduates of programs in the same subject categories in at least one of the indicators, but outcomes differed between cohorts. The B.S. in Environmental Planning and Design at Rutgers University and Geology / Earth Science programs produced graduates in the 2007 and 2008 cohorts who were employed at higher rates in the state a year after graduation than graduates of all programs in their subject category. Graduates of Environmental Science and Environmental Health / Engineering programs employed in New Jersey a year after graduation consistently earned higher incomes than graduates of all programs in the same subject category.

Given that many of those who graduated from the programs examined here did so prior to the recent national focus on green jobs and training, further study of graduates from the large numbers of other credit and noncredit programs that have emerged in recent years is warranted. Analysis presented in this study is descriptive and should not be employed in evaluating these programs because of the low numbers of programs and graduates for which data were available and the lack of detailed data on the occupations of graduates. Additional studies will help policymakers and educators determine which types of green programs produce positive in-state employment outcomes for graduates in comparison to other types of programs. In addition, more research on the types of jobs and industries that employ graduates in the state after graduation would help policy makers better understand how well particular green programs are aligning with the skill and workforce needs of employers. To enable future studies of the outcomes of green education programs, policymakers should consider data collection methods for data on all green program enrollees and graduates, including those in non-credit programs, which make up the largest percentage of all green education and training in New Jersey.



Additional Methods & Data

In this study, researchers matched two New Jersey individual-level, administrative datasets—the Student Unit Record Enrollment (SURE) data system and the Unemployment Insurance (UI) Wage Records. These two datasets enabled researchers to track employment outcomes of graduates who finished their training in green programs. Below is a brief description of the two datasets:

- i) SURE: The New Jersey Commission on Higher Education maintains the SURE data system, which warehouses detailed information from New Jersey colleges and universities on students who enroll in and complete degree programs. The SURE data file includes the following fields: social security number of student; basic demographic information; date and program of enrollment; date of completion; degree or certificate awarded; and program of study CIP code.
- ii) UI Wage Records: Nearly all employers in the state report the wages of their employees on a quarterly basis to the State of New Jersey when they pay their UI payroll taxes. UI wage records include the following information for individuals who are employed: social security number of the employee; the quarterly earnings paid; the number of weeks worked during the quarter; the individual's employer; and the industry of employment. New Jersey UI Wage Record system includes more than 4 million records per quarter.

From the database, researchers can describe the demographics of the completers and calculate the following measures:

- i) Pre-Enrollment Employment Rate: Average employment rate in the fourth quarter before enrollment for the age groups 25 and over and median quarterly earnings in the fourth quarter before enrollment for the age group 25 and over. The measure compares the employment and earnings of students with employment experience before enrollment. In order to start with a more accurate unemployment/employment rate, researchers assumed a lag time of four quarters between the last employment and enrollment
- ii) Post-College Employment Rate and Earnings: Employment rate in the fourth quarter after graduation; median quarterly earnings in the fourth quarter after graduation; quarterly change in earnings for the age group 25 and over (fourth quarter before enrollment vs. fourth quarter after graduation). These are the main measures used in evaluating the employment outcomes of the students after attending



school. Researchers assumed a lag time of four quarters in order to capture the longer term effects of the education

- iii) **Industry of Post-College Employment:** Researchers identified the industry that hires the most graduates for each program and the top three industries that hire most graduates from each school and within New Jersey as a whole

Researchers compared the pre- and post-enrollment earnings only for students who were 25 years or older when they first enrolled in a program. The fourth quarter before enrollment is used to minimize the problem of any pre-enrollment earnings dips for individuals who entered training soon after losing their jobs which could bias estimates of the effect of education on earnings. Additionally, by the fourth quarter after graduation, an individual is more likely to have gained employment in a new field and stable earnings from those jobs.



Appendix A: Summary Statistics

Figure 11. Number of Completers of the 2008 Cohort, by Program

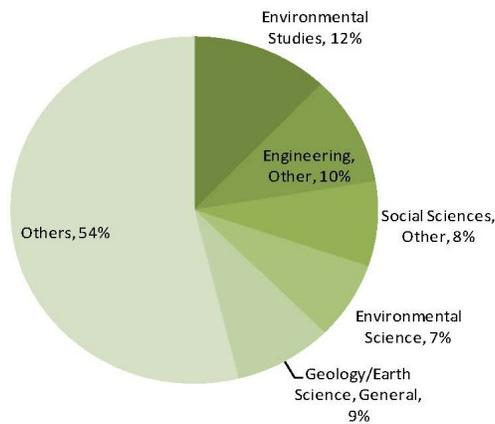


Figure 12. Number of Completers of the 2007 Cohort, by Program

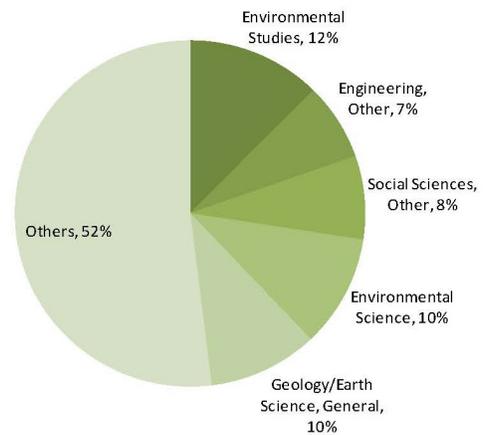


Figure 13. Numbers of Graduates by Program, 2007-2008

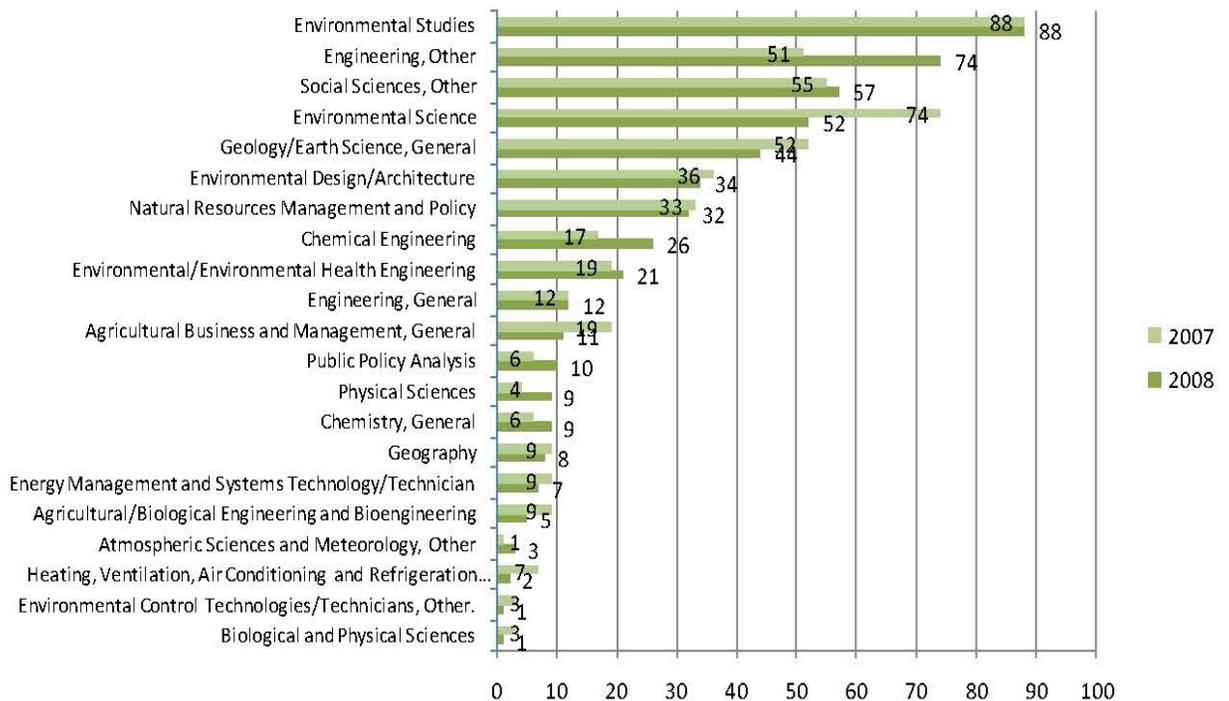




Figure 14. Graduate Numbers by Gender, 2008

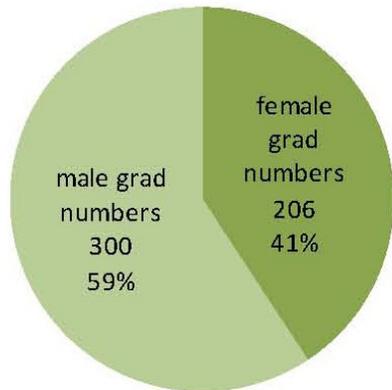


Figure 15. Graduate Numbers by Gender, 2007

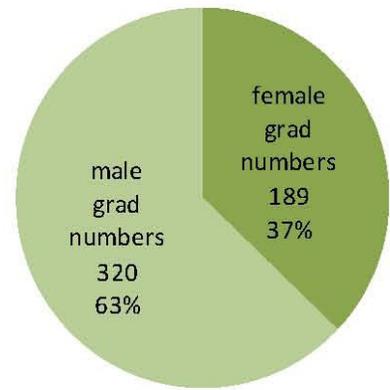


Figure 16. Graduate Numbers by Gender by Program, 2008

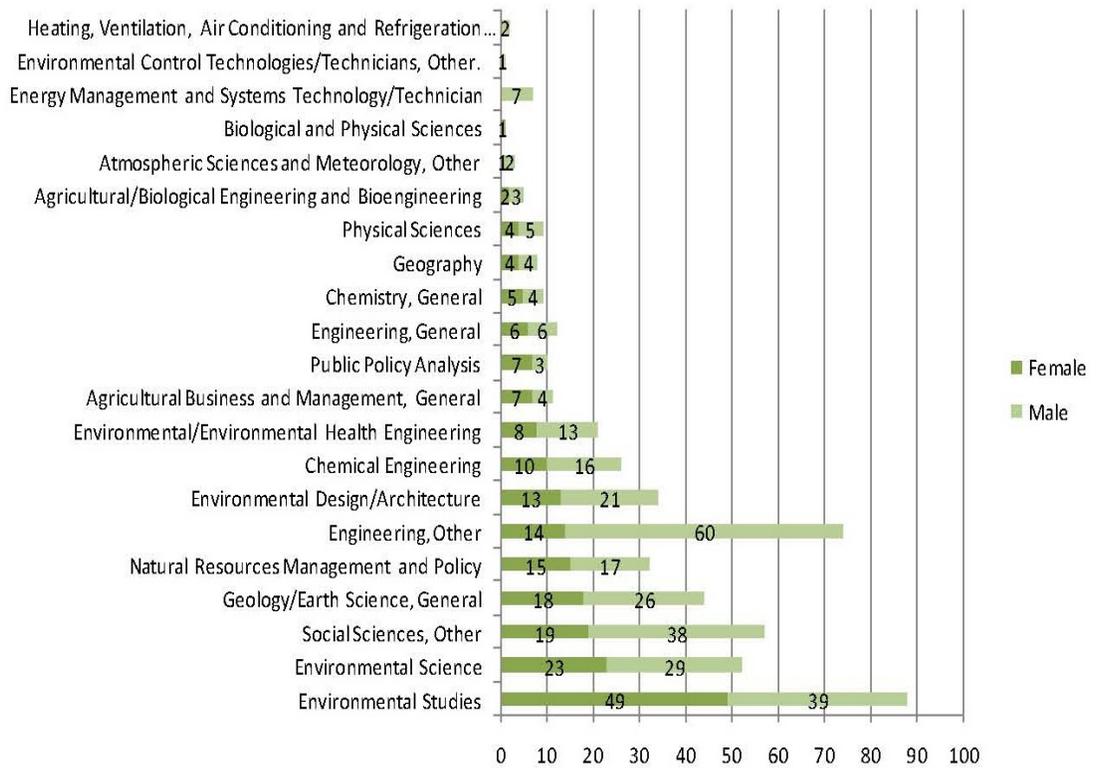




Figure 17. Gender Composition of Graduates by Program

	2007			2008		
	Female	Male	Female/Male Ratio	Female	Male	Female/Male Ratio
Public Policy Analysis	2	4	0.5	7	3	2.33
Agricultural Business and Management, General	6	13	0.46	7	4	1.75
Environmental Studies	48	40	1.2	49	39	1.26
Chemistry, General	2	4	0.5	5	4	1.25
Engineering, General	5	7	0.71	6	6	1
Geography	5	4	1.25	4	4	1
Natural Resources Management and Policy	16	17	0.94	15	17	0.88
Physical Sciences	2	2	1	4	5	0.8
Environmental Science	29	45	0.64	23	29	0.79
Geology/Earth Science, General	22	30	0.73	18	26	0.69
Agricultural/Biological Engineering and Bioengineering	3	6	0.5	2	3	0.67
Chemical Engineering	2	15	0.13	10	16	0.63
Environmental Design/Architecture	9	27	0.33	13	21	0.62
Environmental/Environmental Health Engineering	6	13	0.46	8	13	0.62
Social Sciences, Other	16	39	0.41	19	38	0.5
Atmospheric Sciences and Meteorology, Other	0	1	0	1	2	0.5
Engineering, Other	12	39	0.31	14	60	0.23
Energy Management and Systems Technology/ Technician	1	7	0.14	0	7	0
Environmental Control Technologies/Technicians, Other	1	2	0.5	0	1	0
Heating, Ventilation, Air Conditioning and Refrigeration Engineering Technology/Technician.	0	7	0	0	2	0
Biological and Physical Sciences	2	1	2	1	0	-
Total in New Jersey	189	320	0.59	206	300	0.69



Figure 18. Number of Graduates by Age, 2008

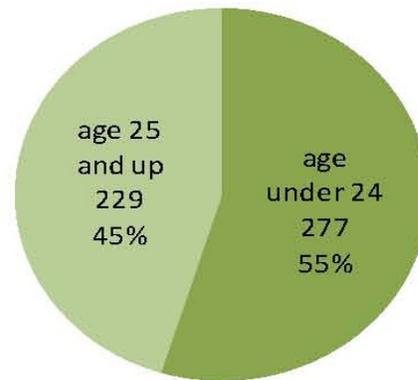


Figure 19. Number of Graduates by Age, 2007

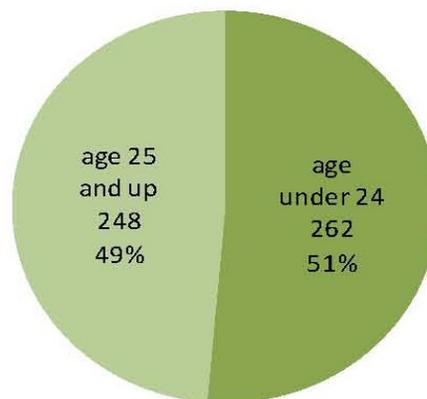




Figure 20. Age Composition of Graduates by Type of Degree

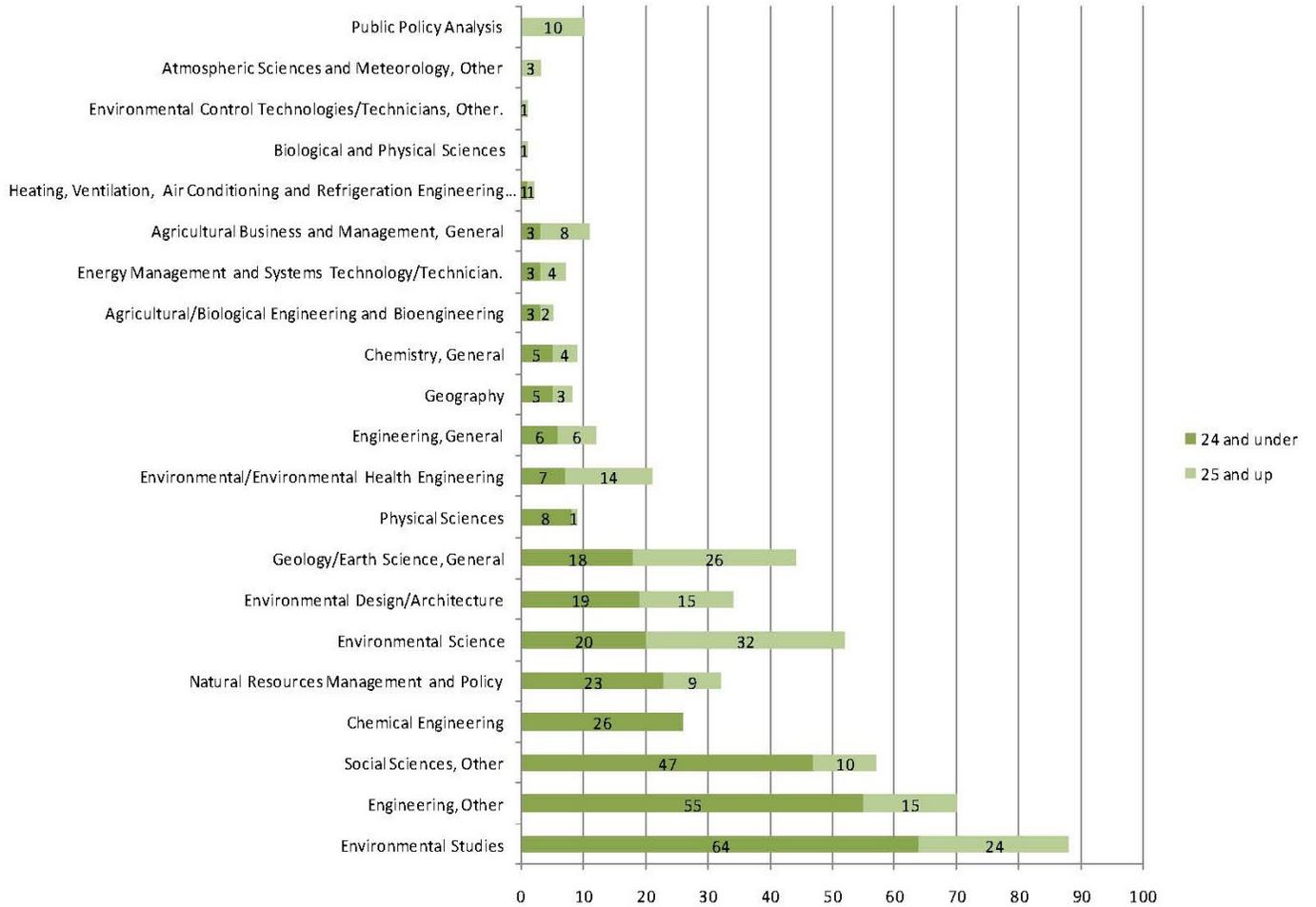
	2007				2008			
	age under 24		age 25 and up		age under 24		age 25 and up	
AA	30	57.69%	22	42.31%	25	53.19%	22	46.81%
BA and BS	227	71.03%	93	28.97%	227	74.43%	78	25.57%
Master's and PhDs	4	2.92%	133	97.08%	25	16.23%	129	83.77%
Total in New Jersey	262	51.37%	248	48.63%	277	54.74%	229	45.26%

Figure 21. Age Composition of Graduates by Degree

	2007				2008			
	24 and below		25 and up		24 and below		25 and up	
Environmental Studies	61	69.32%	27	30.68%	64	72.73%	24	27.27%
Engineering, Other	3	5.88%	48	94.12%	55	55.88%	15	44.12%
Social Sciences, Other	47	85.45%	8	14.55%	47	82.46%	10	17.54%
Chemical Engineering	16	94.12%	1	5.88%	26	100.00%	0	0.00%
Natural Resources Management and Policy	19	57.58%	14	42.42%	23	71.88%	9	28.13%
Environmental Science	25	33.78%	49	66.22%	20	38.46%	32	61.54%
Environmental Design/Architecture	21	58.33%	15	41.67%	19	55.88%	15	44.12%
Geology/Earth Science, General	20	38.46%	32	61.54%	18	40.91%	26	59.09%
Physical Sciences	2	50.00%	2	50.00%	8	88.89%	1	11.11%
Environmental/Environmental Health Engineering	2	10.53%	17	89.47%	7	33.33%	14	66.67%
Engineering, General	8	66.67%	4	33.33%	6	50.00%	6	50.00%
Geography	5	55.56%	4	44.44%	5	62.50%	3	37.50%
Chemistry, General	4	66.67%	2	33.33%	5	55.56%	4	44.44%
Agricultural/Biological Engineering and Bioengineering	7	77.78%	2	22.22%	3	60.00%	2	40.00%
Energy Management and Systems Technology/ Technician.	3	33.33%	6	66.67%	3	42.86%	4	57.14%
Agricultural Business and Management, General	14	73.68%	5	26.32%	3	27.27%	8	72.73%
Heating, Ventilation, Air Conditioning and Refrigeration Engineering Technology/Technician	1	14.29%	6	85.71%	1	50.00%	1	50.00%
Biological and Physical Sciences	3	100.00%		0.00%	0	0.00%	1	100.00%
Environmental Control Technologies/Technicians, Other	1	33.33%	2	66.67%	0	0.00%	1	100.00%
Atmospheric Sciences and Meteorology, Other	0	0.00%	1	100.00%	0	0.00%	3	100.00%
Public Policy Analysis	0	0.00%	6	100.00%	0	0.00%	10	100.00%



Figure 22. Number of Graduates by Age, 2008





Appendix B: Glossary of CIP Categories

	Descriptions of Programs
Biological and Physical Sciences* (Ramapo College, BA in Integrated Science Studies with Biology/ Environmental Studies Concentration)	The Integrated Science Studies major is designed to meet a growing need for people whose knowledge of science is to be directed to its use, expression, and administration in both the private and public sectors. Students in the major are expected not only to achieve specific competencies in the sciences, but also to develop a critical understanding of the roles of the sciences in social, political, and economic contexts.
Environmental Control Technologies/Technicians, Other	Any instructional program in environmental control technologies that are not categorized as Heating, Ventilation, Air Conditioning and Refrigerating Engineering, Energy Management and Systems, Solar Energy, Water Quality and Wastewater Treatment Management and Recycling, Environmental Engineering Technology, or Hazardous Materials Management and Waste Technology/ Technician.
Heating, Ventilation, Air Conditioning and Refrigeration Engineering Technology/Technician	A program that prepares individuals to apply basic engineering principles and technical skills in support of engineers and other professionals engaged in developing and using air conditioning, refrigeration, ventilation, and heating systems. Includes instruction in principles of heating and cooling technology, design and operational testing, inspection and maintenance procedures, installation and operation procedures, and report preparation.
Atmospheric Sciences and Meteorology, Other (Rutgers: Ph.D. in Atmospheric Sciences)	Atmospheric science is a relatively broad discipline that involves the diagnosis and prediction of atmospheric processes, including climate change, atmospheric radiation, large-scale weather systems, severe storms, and air-sea interactions.
Agricultural/Biological Engineering and Bioengineering	A program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems, equipment and facilities for production, processing, storage, handling, distribution and use of food, feed, and fiber. Includes applications to aquaculture, forestry, and human and natural resources.
Energy Management and Systems Technology/ Technician	A program that prepares individuals to apply basic engineering principles and technical skills in support of engineers and other professionals engaged in developing energy-efficient systems or monitoring energy use. Includes instruction in principles of energy conservation, instrumentation calibration, monitoring systems and test procedures, energy loss inspection procedures, energy conservation techniques, and report preparation.
Geography (Montclair State University: BA in Geography)	The Geography majors may specialize in environmental studies. The Environmental Studies concentration combines the core geography degree with an interdisciplinary social science and physical science focus in the environment. In the expanded (60 credit) curriculum, geography is combined with other earth sciences, chemistry or biology, and economics or legal studies.
Chemistry, General (Richard Stockton College: BS in Chemistry)	The program seeks to provide students an opportunity to acquire a sound foundation in chemistry, and to see its broader applications. Students are encouraged and expected to develop a comprehensive view of their subject as more than a simple sequence of courses. This requires attention to questions of methodology and intellectual style.



Physical Sciences (Warren County Community College: AA in Science in General Science)	<p>This program is designed for students seeking transfer to a four-year program in environmental studies or employment at the associate's degree level. Employment opportunities based on a background in environmental studies exist in a diverse number of fields with government, industry, consulting firms, and nonprofit groups. Some programs this degree prepares you for: Environmental Science and Environmental Studies.</p>
Public Policy Analysis (NJIT: MA in Environmental Policy Studies)	<p>The Master of Science in Environmental Policy Studies focuses on the role of the social sciences in the development, implementation, and evaluation of environmental policy. Building on the strengths of a technological university, students take foundation courses in geography, economics, and policy. Application courses on economic modeling and geospatial analysis enable students to acquire skills in the tools and methods used in environmental problem solving and policy analysis. The core faculty is multidisciplinary with strengths in geography, economics, and planning. Affiliated faculty have backgrounds in chemistry, engineering, and history. Graduates of the program have secured employment in both the public and private sectors including: the United States, the New Jersey Department of Environmental Protection, regional planning commissions, local community development programs, private engineering and planning firms, and software development corporations. Graduates have also entered doctoral level programs in environmental science, history, and law.</p>
Agricultural Business and Management, General	<p>A general program that focuses on modern business and economic principles involved in the organization, operation, and management of agricultural enterprises.</p>
Engineering, General (Union County College: AA in Engineering/Environmental Science)	<p>The Environmental Science Option offers the first two years of a bachelor's degree program with a major in environmental science or environmental engineering. It is designed for students who seek a career in some field of environmental protection, waste management, and pollution control.</p>
Environmental/Environmental Health Engineering	<p>A program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems for controlling contained living environments and for monitoring and controlling factors in the external natural environment, including pollution control, waste and hazardous material disposal, health and safety protection, conservation, life support, and requirements for protection of special materials and related work environments.</p>
Chemical Engineering (Rowan University: BS in Chemical Engineering)	<p>The Rowan University Chemical Engineering Program is a student-centered, primarily undergraduate program that incorporates leading-edge educational methods and technology with engineering practice. It prepares students for careers in the global chemical process industry and related fields, and for advanced degree study. The program provides students with a strong foundation in chemical engineering science and design, and emphasizes the development of effective communication and teaming skills, and professional responsibility in preparation for a career in a diverse global workforce.</p>
Natural Resources Management and Policy	<p>A program that prepares individuals to plan, develop, manage, and evaluate programs to protect and regulate natural habitats and renewable natural resources. Includes instruction in the principles of wildlife and conservation biology, environmental science, animal population surveying, natural resource economics, management techniques for various habitats, applicable law and policy, administrative and communications skills, and public relations.</p>



Environmental Design/Architecture (Rutgers: BS in Environmental Planning and Design)	<p>This curriculum provides a broad educational experience emphasizing an understanding of planning and design as they relate to the physical environment and the management of that environment. Particular attention is given to the interaction of natural and social systems. The curriculum includes four options: Environmental Geomatics, Environmental Planning, Landscape Architecture, and Landscape Industry.</p>
Geology/Earth Science, General	<p>A program that focuses on the scientific study of the earth; the forces acting upon it; and the behavior of the solids, liquids, and gases comprising it. Includes instruction in historical geology, geomorphology, and sedimentology, the chemistry of rocks and soils, stratigraphy, mineralogy, petrology, geostatistics, volcanology, glaciology, geophysical principles, and applications to research and industrial problems.</p>
Environmental Science	<p>A program that focuses on the application of biological, chemical, and physical principles to the study of the physical environment and the solution of environmental problems, including subjects such as abating or controlling environmental pollution and degradation; the interaction between human society and the natural environment; and natural resources management. Includes instruction in biology, chemistry, physics, geosciences, climatology, statistics, and mathematical modeling.</p>
Social Sciences, Other (Rutgers University: BS in Environmental and Business Economics)	<p>The major in Environmental and Business Economics is a program of study for students interested in careers in business and management. Students learn to think strategically about the business environment within which firms, government agencies, and nongovernmental organizations operate and devise appropriate responses to gain a strategic advantage within such an environment.</p>
Environmental Studies	<p>A program that focuses on environment-related issues using scientific, social scientific, or humanistic approaches or a combination. Includes instruction in the basic principles of ecology and environmental science and related subjects such as policy, politics, law, economics, social aspects, planning, pollution control, natural resources, and the interactions of human beings and nature.</p>
Engineering, Other (Stevens Institute of Technology: M.S. in Environmental Engineering)	<ul style="list-style-type: none"> EN 505 Environmental Engineering EN 541 Fate and Transport of Environmental Contaminants EN 545 Environmental Impact Analysis and Planning EN 547 Project Life Cycle Management EN 548 Environmental Compatibility in Design and Manufacturing
<p>Source: General program descriptions are from Classification of Instructional Programs (CIP 2000), National Center for Educational Statistics, retrieved on 07/17/2011: http://nces.ed.gov/pubs2002/cip2000/crosswalk.ASP; New Jersey's specific programs' descriptions are from the Center's inventory of green program.</p>	



About the Heldrich Center

The John J. Heldrich Center for Workforce Development, based at the Edward J. Bloustein School of Planning and Public Policy at Rutgers, The State University of New Jersey, is a dynamic research and policy center devoted to strengthening the nation's workforce. It is one of the nation's leading university-based centers devoted to helping America's workers and employers respond to a rapidly changing 21st Century economy.

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