ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE ENGINEERING AND TECHNOLOGY

THE POTENTIAL OF GREEN JOBS IN TURKEY

M.Sc. THESIS

Gülcan ORAK ORUÇ

Department of Urban and Regional Planning

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Thesis Advisor: Prof. Dr. Tüzin Baycan

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TÜRKİYE'DE YEŞİL İŞLERİN POTANSİYELİ

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Gülcan Orak Oruç, a M.Sc. student of ITU Graduate School of Science Engineering and Technology student ID 502141054 successfully defended the thesis/dissertation entitled "THE POTENTIAL OF GREEN JOBS IN TURKEY", which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

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To my family,

FOREWORD

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May 2018 Gülcan ORAK ORUÇ

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ABBREVIATIONS

AFD : Agence Française de Dévelopement
ARRA : The American Recovery and Reinvestment Act
BLS : The Bureau of Labor Statistics
BREEAM : Building Research Establishment Environmental Assessment Method
CEDEFOP : European Centre for the Development of Vocational Training
CNG : Compressed Natural Gas
DELEG : Department of Energy, Labour and Economic Growth
DWCPs : The Decent Work Country Programmes
EDF : Environmental Defense Fund
EMG : Environment Management Group
ETA : Employment and Training Administration
EU : European Union
GDP : Gross Domestic Product
GGEI : The Global Green Index
GGGI : Global Green Growth Institute
GGKP : Green Growth Knowledge Platform
GGND : Global Green New Deal
GHG : Greenhouse Gas
GIZ : Gesellschaft für Internationale Zusammenarbeit
GW : Gigawatts
HSBC : The Hongkong and Shanghai Banking Corporation
HVAC : Heating, Ventilating and Air Conditioning
I-O : Input–Output
ICLEI : The International Council for Local Environmental Initiatives
IDC : Industrial Development Corporation
IEA : The International Energy Agency
ILO : International Labour Organization
IOE : The International Organization of Employers
IPCC : The Intergovernmental Panel on Climate Change
IRENA : The International Renewable Energy Agency
ISCO : The International Standard Classification of Occupations
İŞKUR : Turkish Employment Agency
ITDP : The Institute for Transportation and Development Policy

ITUC : International Trade Union Confederation
LEED : Leadership in Energy and Environmental Design
LSE : London School of Economics
MCED : Ministerial Conference on Environment and Development
MDGs : Millennium Development Goals
MENA : Middle East and North Africa
MW : Megawatt
MWh : Megawatt hour
NACE : European Classification of Economic Activities
NGO : Non-governmental organization
OECD : Organisation for Economic Co-operation and Development
PV : Photovoltaic
REN21 : Renewable Energy Policiy Network for the 21st Century
SAMs : Social Accounting Matrices
SDGs : The Sustainable Development Goals
TURKSTAT : Turkish Statistic Institution
UN : United Nations
UNCSD : The United Nations Conference on Sustainable Development
UNEGM : United Nations Environment Management Group
UNEP : United Nations Environment Programme
UN ESCAP : United Nations Economic and Social Commission for Asia and the Pacific
UNESCO : United Nations Educational, Scientific and Cultural Organization
US : The United States
USDOL : The USA Department of Labor
USGBC : The U.S. Green Building Council
WCED : World Commission on Environment and Development
WIC : The Workforce Information Council
WWEA : World Wind Energy Association
WWF : World Wild Fund
WWSD : The World Summit on Sustainable Development

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THE POTENTIAL OF GREEN JOBS IN TURKEY

SUMMARY

Besides to environmental issues caused by climate change, according to Global Risk Perception survey which is carried out by the World Economic Forum in 2017, with a range of various age groups, countries and sectors, unemployment and underemployment trend take the first line as the most challenging trend over the next 10 years. Creating green jobs is seen as the key solution to respond to unemployment threat especially for youth and to meet the challenges of transition towards a green economy. Although there is no consensus about the definition of green jobs, attempts have been taken in international agendas and developed countries have already created national perspective whereas developing countries are struggling to build their own definition with local perspective and policy framework. In Turkey, as an emerging country, the intention of creating a green vision is also popular that some big private companies are trying to adapt their strategic plans as well as national development plans. Relatedly, green economy and green jobs are the brand-new concepts that Turkey tries to dig into for developing its own national and local framework. Following to green economy, green jobs take place in legal policies indirectly. It is observed that the transition process from green economy policies into reality is straggling especially for developing countries. To facilitate the establishment of green jobs development path, this study intends to focus on figuring out the potential of Turkey, while the green economy and green jobs strategies are ongoing. While addressing all green key concept evaluation through a literature review, the study internalizes the International Labor Organization’s (ILO) conceptual framework and methodology to classify sectors and to assess the green job potential via decent work criteria. The study illustrates the existing and potential level of economic activities related to green sectors of Turkey under the ILO’s conceptual and methodological framework. Although green jobs can be created in many sectors, some employment areas potentially serve as more advantageous for accelerating the steps of the national green economy roadmap. Focusing on the selected areas shed light on the capacity of Turkey’s labor force.

This thesis is motivated to be a leader in this field to reveal green jobs notion for Turkey. Furthermore, making estimation in number looking through sector-based employment is the essential point to comprehend a green jobs roadmap. This study intends to fulfill the gap and takes a further step to calculate the current situation and makes assumptions for future developments. In addition, this study finalizes the research highlighting further steps that should be taken. Regarding the meaning of green jobs and green economy implications in the labor market context, further steps are recommended to comprise all sectors analysis regarding actors and stakeholders. Solving the data collection system can lead to make an accurate estimation and to apply the right policies. Within rational implications and green jobs roadmap, social welfare, as well as environmental protection, can be observed. Powerful and conscious green employment will lead the nation to be more productive and competitive.

TÜRKİYE’DE YEŞİL İŞLERİN POTANSİYELİ

ÖZET

İklim değişikliğinin yol açtığı çevresel sorunların yanı sıra, Dünya Ekonomik Forumu tarafından 2017 yılında yapılan ve çeşitli yaş grupları, ülkeler ve sektörler ile gerçekleştirilen Küresel Risk Algısı anketine göre, işsizlik ve eksik istihdam eğilimleri gelecek 10 yılın en zorlayıcı sorunları arasında ilk sıralarda yer almaktadır. Yeşil işler, işsizlik sorununa cevap vermek ve yeşil ekonomiye geçişin zorluklarını aşmak için kilit çözüm önerilerinden biri olarak görülmektedir. Yeşil işlerin tanımı konusunda bir fikir birliği bulunmamakla birlikte, uluslararası gündemde yeşil işlere dair birçok girişim de bulunmaktadır. Gelişmiş ülkeler kendi ulusal perspektifini oluşturmuş, gelişmekte olan ülkeler ise yerel bakış açısı ve politika çerçevesi ile kendi tanımlarını oluşturmaya çalışmaktadırlar. Gelişmekte olan bir ülke olan Türkiye’de ise, yeşil vizyon oluşturma çabaları hem özel şirket strateji raporlarında hem de ulusal kalkınma planlarında popüler bir yaklaşım olarak göze çarpmaktadır.

Yeşil ekonomi ve yeşil işler, Türkiye’nin de ulusal ve yerel düzeyde geliştirmek için araştırmalar yaptığı oldukça yeni yaklaşımlardır. Yeşil ekonomi ile ilgili hedefler, ulusal ve yerel gelişme planlarında ve stratejik dokümanlarda yer almaktadır, ancak yeşil işler konusundaki çalışmalara yönelik hedefler henüz gelişmemiştir. Bu çalışma, ülkenin yeşil girişimlerine yönelik politikalara katkı sunmak amacıyla, Türkiye’nin bu bağlamdaki potansiyelini vurgulayarak, yerel ve ulusal düzeyde yeşil işler konusunda literatür oluşmasına katkı sağlamaktadır. Türkiye’de ulusal düzeyde sektörel odaklı yeşil iş potansiyelini sayısal olarak araştıran bir çalışma olmaması, bu çalışmanın temel motivasyonunu oluşturmaktadır.

Tezin içeriği 5 ana bölümden oluşmaktadır. İlk bölümde yeşil işleri araştırma konusu olarak seçme amacı ile yeşil işler konusunun dünya genelinde bulunduğu konum ve öneminden bahsedilmektedir. Tezin içeriğini şekillendiren araştırma soruları, yeşil işler kavramını anlayarak, kavramın Türkiye uygulaması deneyimi için ışık tutmaya yöneliktir.

Tezin ikinci bölümü literatür taramasına dayanarak, yeşil işler olgusunun ortaya çıkış sürecini, dayandığı sürdürülebilirlik esaslarını ve geliştirdiği diğer kavramları kronolojik olarak sunmaktadır. Bölüm, her kavramı tek tek ele alarak, literatürde yer alan farklı tanımları ve kavramlar arası etkileşimi vurgulamaktadır. Yeşil işler konusunda lider bir aktör konumunda olan Uluslararası Çalışma Örgütü (ILO) konuya ışık tutan teorik altyapıya katkıda bulunmakta ve pratiğe yönelik örnek çalışmalar sunmaktadır. Şimdiye kadar hem gelişmekte olan hem de gelişmiş olarak nitelendirilen 30’dan fazla ülke için yeşil işler değerlendirme raporu yayınlamıştır. Bu tez çalışması kapsamında, yeşil işler kavramı için ILO’nun geliştirdiği en kapsamlı tanım benimsenmektedir. ILO, yeşil işleri hem çevre dostu ekonomik aktiviteleri hem de insana yakışır iş kavramını birleştiren bir tanım ile savunmaktadır.

Tezin üçüncü bölümü, yeşil işler konusuna odaklanmaktadır. Bu bölümde yeşil ekonomi ve yeşil işler kavramları ile ortaya çıkan ekonomik aktiviteler ve iş kolları

örneklendirilmektedir. Ek olarak, yeşil işleri sektör ölçeğinde sınıflandıran çalışma örneklerine yer verilmektedir. Bu çalışmalar ile birlikte üçüncü bölüm, yeşil işlerin gelişimini desteklemeye yatkın sektörleri belirleyerek, ekonomik aktivitelerin yeşil iş yaratabilme potansiyelini sorgulamaktadır. Yeşil işler konusunda anahtar sektörler, enerji, inşaat ve ulaşım olarak öne çıkmaktadır. Enerji sektöründe özellikle yenilenebilir enerji yeşil iş yaratma potansiyelinde öncüdür. Çevreye en az zararı olan iki yenilenebilir enerji kaynağı, rüzgâr ve güneş, ayrı olarak ele alınmaktadır. Mevcut durumda bu iki enerji kaynağına dayanan sektörlerin dünya genelinde üretim ve tüketim rakamları ile yaratmış olduğu iş kapasitesi aktarılmaktadır. İnşaat ve ulaşım sektörleri de aynı şekilde belirtilmektedir. Ayrıca, bölüm içerisinde literatüre katkıda bulunan çalışmaların yeşil işler için kapasite belirlemek ya da öngörüde bulunmak üzere kullandıkları analiz yöntemleri de araştırılmıştır. Buna göre, dünya genelinde en çok kullanılan dört analiz yaklaşımı detaylandırılmaktadır. Amerika Birleşik Devletleri bu konuda ilk çalışmaları başlatan ülkeler arasındadır. Ülkenin işgücü üzerine çalışan kurumlar tarafından benimsenmiş olan yeşil işler, faaliyet alanlarına göre sınıflandırılmakta ve ülkenin veri tabanına işlenmektedir. Bu veri setine dayalı iki sınıflandırma yaklaşımı sunulmaktadır. İlk sınıflandırma çevre dostu üretim sürecine sahip olanlar ve çevre dostu ürün üretenlerdir. İkinci sınıflandırma yaklaşımı, işgücünün becerileri üzerinden, yeni ve gelişmekte olan becerilere sahip meslekler, talebi artan meslekler, yeşil becerisini geliştirebilecek meslekler olarak karşımıza çıkmaktadır. Diğer bir yöntem olan, Asya İş Konseyi tarafından geliştirilen ve Çin, Kore, Endonezya, Tayland, Singapur gibi Asya kıtası ülkeleri üzerinde uygulanan analiz, indeks çalışması ile yeşil işleri değerlendirmektedir. Bu indeks, dört ana kategoriye dayanmaktadır. Son yaklaşım olarak, ILO tarafından geliştirilen yaklaşım beş görev üzerinden şekillenmektedir. Beş görev üzerinden ilk olarak ülkenin ekonomi ve işgücü dinamikleri araştırılmaktadır. İkinci adımda, çevre dostu iş kollarının belirlenmesi üzerine atılacak adımlara yer verilmektedir. Üçüncü adımda, bulunan çevre dostu iş kolları yine ILO tarafından geliştirilmiş olan insana yakışır meslek ölçütleri ile değerlendirilmektedir. Bu adımla yeşil işler belirlenmektedir. Hâlihazırda bulunan veri setlerine göre yeşil işleri belirleme adımı için farklı matematiksel modeller de önerilmektedir. Son olarak, bölüm kapsamında diğer ülke deneyimleri aktarılmaktadır. Yeşil işleri destekleme ve geliştirme konusunda Amerika, Çin ve Almanya örnekleri detaylı olarak açıklanmıştır.

Tezin dördüncü bölümü Türkiye'nin yeşil işler konusunda değerlendirilmesi üzerine yoğunlaşmaktadır. İlk olarak Türkiye'nin sürdürülebilirlik ve yeşil ekonomi üzerine yaptığı çalışmalar, bulunduğu konum araştırılmaktadır. Ekonomi ve işgücünün genel durumuna kalite kapsamında bakılmakta, çeşitli sürdürülebilirlik ve yeşil ekonomi indeksleri ile mevcut durum ortaya koyulmaktadır. Mevcut durum dikkate alındığında, işsizlik oranlarının OECD ülkelerine göre yüksek, işgücü oranlarının ise genele göre düşük seyrettiğini söylemek mümkündür. İşgücünün, işsizlik sorunlarının yanı sıra sosyal hak ve güvencelerinin sağlanması, cinsiyet eşitsizliği gibi sorunları olduğu da belirtilmektedir. Sürdürülebilir Kalkınma Hedefleri çalışmalarında 2017 ölçümlerine göre 150 ülke içerisinde 68.sırada olmasına rağmen, hedeflere yönelik ilerlemelerin istenen düzeyde olmadığı görülmektedir. OECD İyi Yaşam İndeksi'ne göre ise özellikle iş alanlarında çalışanların eşitlik, sosyal hak gibi konularda mutsuz oldukları ve diğer ülkelere göre standartların altında olduğu aktarılmaktadır. Bununla birlikte bölüm kapsamında, ülkenin geliştirmeye çalıştığı sürdürülebilirlik ve yeşil ekonomi odaklı çalışmaların stratejik ve yasal boyutu incelenmektedir. Bu doğrultuda, ülkenin beş yıllık kalkınma planları, ulusal strateji planları, sürdürülebilirlik hedeflerine yönelik geliştirilen dokümanlar ve en son çıkan yasal düzenlemeler dikkate alınmaktadır. İncelemeler sonucunda, yeşil işler kavramının ifade edilmediği ve kavramın belirli ortak bir tanımlamaya sahip olmadığı görülmektedir. Ancak, yasal çerçevede yeşil ekonomi, yeşil binalar ve enerji verimliliği konusunda faaliyetler desteklenmektedir. Mevcut durumu ortaya koyduktan sonra, Türkiye için henüz uygulanmamış olan ILO'nun beş görev metodu benimsenerek ülkenin yeşil işler konusunda potansiyeli değerlendirilmektedir. ILO, önerdiği analiz yaklaşımını hem gelişmiş hem de gelişmekte olan ülkelere uygulamaktadır. Farklı veri setleri için görevlerin yöntemleri adapte edilmektedir. Bu çalışma da Türkiye'nin erişilebilir veri setlerine göre ILO yöntemini uygulamaktadır. Ülke ölçeğinde veri kullanılan çalışmada, yayınlanan raporlardan ve ulusal istatistiki veri tabanından yararlanılmaktadır. Türkiye için adapte edilen görevlerin ilki, Türkiye dinamiğini anlamaya yöneliktir. İkinci adım, Türkiye'nin yasal boyutu, uluslararası standartlar ve çalışmalar temel alınarak, Türkiye için yeşil iş gelişimini hızlandırabilecek ana sektörleri tanımlamaktadır. Bu sektörler tarım, enerji, inşaat ve ulaşım olarak belirlenmiştir. Üçüncü adım olarak, bu sektörler içerisinde çevre dostu olarak tanımlanabilecek alt faaliyet alanları araştırılmaktadır. Bu kapsamda da uluslararası standartlar ve çalışmalar ile ülkenin stratejik hedefleri dikkate alınmaktadır. Görev sonucunda, organik tarım, rüzgâr ve güneş enerjisi, yeşil binalar ve toplu taşıma önemli alt sektörler olarak belirlenmiştir. Belirlenen bu alt sektörler, ILO'nun insana yakışır iş göstergeleri arasında yer alan kayıt dışı istihdam, ortalama çalışma saatleri, kadın-erkek oranı ve bağlı bulundukları sendikalara kayıt oranları ile değerlendirilmekte, değerlendirme sonucu yeşil işler kategorisi oluşturulmaktadır. Belirlenen alt sektörler veri seti yetersizliği nedeniyle insana yakışır iş kriterleri ile ölçülememiştir. Ana sektörler ölçeğinde yapılan insana yakışır iş analizi ile çalışanların, özellikle kayıt dışı istihdam ve cinsiyet eşitsizliği konusunda sorunlar yaşadığını tespit edilmektedir. Uluslararası çalışmalardan alınan referansla yapılan varsayımlar doğrultusunda organik tarım, rüzgâr ve güneş enerjisi, yeşil binalar ve toplu taşıma alt sektörleri yeşil işler sınıfında ele alınmaktadır. Yeşil işler olarak belirlenen faaliyetler, ülke strateji vizyonu ile paralel olarak 2023 yılını hedef almaktadır. Alt sektörlerin 2023 yılına kadar geliştirebilecekleri yeşil iş kapasitesi iki yöntem aracılığı ile değerlendirilmektedir. Organik tarım, rüzgâr ve güneş enerjisi faaliyetleri istihdam faktörü ile yeşil binalar ve toplu taşıma yatırımının yaratacağı istihdam faktörü ile hesaplanmaktadır. Organik tarım, kullanılan tarım arazisinin artmasına karşılık yaratacağı istihdam faktörü ile 2016-2023 yılları arasında yaklaşık 50.000 yeşil iş yaratmaktadır. Rüzgâr ve güneş enerjisi, kurulu gücün yaratacağı istihdam faktörü ile 2016-2023 yılları arasında yaklaşık 430.000 yeşil iş öngörmektedir. Yatırımın yaratacağı istihdam faktörü için 2023 yatırım hedefleri dikkate alınmaktadır. Bu doğrultuda, yeşil binalar 2013-2023 yılları arasında yaklaşık 7 milyon, toplu taşıma yatırımları ise 2013-2023 yılları arasında yaklaşık 2 milyon yeşil iş yaratmaktadır. Sonuçlar, Türkiye'nin 2023 yılına kadar yaklaşık 10 milyon f yeşil iş yaratma potansiyeli olduğunu ortaya koymaktadır.

Bu çalışma Türkiye'nin sürdürülebilirlik ve yeşil işler konusunda gelişmeye açık yönlerini vurgulamakla birlikte zorluk yaşayabileceği yönlere de ışık tutmaktadır. Çalışma sonucunda ortaya çıkan umut verici yeşil iş potansiyeli, Türkiye için oldukça yeni olan yeşil işler konusunda atılacak adımları desteklemektedir. Son bölüm kapsamında, yeşil ekonomi ve yeşil işler kavramlarının ulusal ve yerel düzeyde geliştirilmesi için önerilerde bulunulmaktadır. Elde edilen sonuçlar, diğer ülkelerin deneyimlerine bağlı olarak gelişen standartları referans aldığı için sınırlandırma oluşturmaktadır. Ulusal kapasiteye yönelik standartların oluşturulması ve gerekli verilerin ulusal düzeyde toplanması gelişmeye açık olan bu konuyu destekleyecektir.

Atılacak adımlar, öncelikle ulusal düzeyde yapılacak mevcut durum analizleri ile aktör ve paydaş şemaları çıkartmaya, etkileşimli çalışmalar yapmaya yönelik olmasında fayda vardır. Bu çalışmalara paralel olarak ulusal veri tabanı oluşturmaya yönelik girişimlerin desteklenmesi, yeşil işler kavramının tanımı ve kapsamının ulusal düzeyde üretilmesi, uzun soluklu çalışmalarla tüm sektörleri kapsayan, uygulanabilir politikalar sunan, iyi bir yeşil iş gelişim yol haritasının üretilmesi önem taşımaktadır.

Yeşil işler, istihdamı tehdit eden bir senaryo değildir. Doğru kurgulanan ve atılan adımlarla yeşil işler, ülkeleri uluslararası alanda daha üretken ve rekabetçi bir düzeye taşıyabilecek güce sahiplerdir.

1. INTRODUCTION

The economic system of the world is flawed, although some players are satisfied with the old economic model. Besides, the traditional model has failed to satisfy the global labor force as well as environmental needs. Regarding the urgency about the needs of changing unsustainable production and consumption pattern, many nations are expected to prioritize a sustainable roadmap. Despite the agreements and commitments such as the UN's Sustainable Development Goals (SDGs), it is obvious that the existing economic model is holding because of corporates' greed (Burrow, 2018).

Enforcement of the fundamental human and labor rights are seen as dispensable by many corporations. They are not concerned about the minimum living wage or refuse to pay extra working hours. In addition, many people work in informal sectors and they are confronting problems such as low wages, unsafe conditions, no health insurance (Renner et al, 2008a). In 2015, it is stated in Luhby's colomn that 71 percent of the world's population remain low-income or poor, living off $10 or less a day, according to a new Pew Research Center report that investigates income in 111 countries between 2001 and 2011 (Luhby, 2015). ITUC Global Poll of 2017 noticed that 85percent of the workforce is ready to break rules (Burrow, 2018).

At the same time, the unemployment ratio has been increasing globally. According to the International Labor Organization (ILO) calculations, in March 2017 world unemployment rate is 5.78 percent (URL-1). One of the major challenges for all countries is the youth unemployment rate. In 2017, OECD Data publish the rate as 13 percent (URL-2). Tens of millions of young people join the labor market each year, thus the need for jobs is increasing albeit that there is the high ratio of youth unemployment (Renner et al, 2008a). Global Risks Perception Survey announced five risks of greatest concern for doing business in a period of 2017-2018. Unemployment or underemployment rank as the first key issue (World Economic Forum, 2017).

Parallel to unemployment and underemployment problems, educational perspective feeds the mainstream. According to Mckinsey survey conducted among young people and employers in nine countries, the 40 percent of respondents emphasize the problem of lack of skills as a reason for entry-level job posts. It is argued that educational framework lag behind the changing nature of work. It causes that graduate people remain inadequate (Manyika, 2017).

There is always a contradiction between the economy and the environment from the beginning of sustainability terminology. In the Brundtland Report named “Our Common Future”, which is a well-known cornerstone to build the consciousness globally about environmental degradation, it indicates the necessity of putting sustainability into economic development: “What is needed now is a new era of economic growth—growth that is forceful and at the same time socially and environmentally sustainable.” (Brundtland Report, 1987, p.7). It is witnessed that many global agreements have been trying to draw a roadmap for economic growth regarding the environmental, social and economic dimensions, which are defined as sustainability pillars. Within this context, the duty of each country is to specify their own sustainable development pathway according to national resource endowments, challenges, needs and priorities (UNEP,2009).

Every country has concerns on different scales and complexities regarding global environmental issues. Even though there were many attempts, it is seen that economic development policies have remained as high growth and carbon-based (Gibbs and O’Neill, 2015). Then, discussions are structured around creating a new economic model whereby environmental challenges are seen as economic opportunities. Therefore, policies at the global and national levels have been processed to present coherent and integrated approaches, and to develop new concepts such as green economy, green growth and low carbon development (UNEP, 2011).

The green economy concept has revealed an impulsion for new road-mapping while balancing economic development and sustainability dimensions. In the direction of right policy structure, green economy brings the chance to create more and better jobs, to find a way out of poverty and to support social inclusion (ILO, 2014). The former experience in economic growth was inefficient economically, environmentally, in employment and social perspectives. In fact, it can be said that the past growth model focuses on capital instead of people and failed to meet aspirations of society in terms of quality of work and life (URL-15). Therefore, governments turn on the transition process towards a green economy. Indeed, besides to nations, businesses have taken responsibility for the environment by preparing new business development strategic plans. This leads to a growing interest in the developing of new types of business that aspire to modify mainstream economic activity (Gibbs and O'Neill, 2015).

In 2012, ILO emphasized that "the transformation to a greener economy could generate 15 to 60 million additional jobs globally over the next two decades and lift tens of millions of workers out of poverty" (URL-15). According to the International Renewable Energy Agency, there are 2.3 million existing green job occupations in the year 2014 and the number is expected to reach 21 million by the year 2030 (Renner et al, 2008). Moreover, ILO announced that approximately 1.5 million people would benefit from the potential of green jobs in the next 30 years (URL-15).

There is an increasingly growing interest in green jobs among academics, international institutions, and governments. It is believed that the high growth potential of green jobs gives an advantage in the replacement of the traditional carbon-based production pattern into energy-efficient systems. Indeed, the green job creation is seen as a very special policy that refers to two kinds of problems and solutions. Green jobs propose to create not only new employment opportunities but also outline for minimizing climate change impacts (Renner et al, 2008a).

Many national governments are developing their own definitions, either to serve as a basis for collecting statistics or for making policy choices. The notion of green jobs is relatively new and currently, likewise other developing countries, there is no accepted or developed green jobs definition in Turkey. However, renewable energy and energy efficiency topics have remained hot topics. In recent years, awareness has increased with respect to climate change and the need for energy efficiency. National legal and strategical framework attempts to adopt energy efficiency. It might be said that these attempts are related to green jobs indirectly. They are not sufficient for the green job development; however, they galvanize the creation of green jobs. It is obvious that there is a need to develop national and local level strategic structures.

1.1 Purpose of the Thesis

It is fact that the global workforce will be affected by the transition process towards a green economy. Some sectors and jobs will disappear while new sectors and jobs have been created (Renner et al, 2008). Although the changes in employment patterns are seen as a threatening scenario especially for developing countries, experiences from the developed and some of the developing countries prove that there is a great potential for creating jobs while transferring towards a green economy. ILO Director-General Juan Somavia expressed that "environmental sustainability is not a job killer if countries commit right mix policy" (URL-15). Thus, it is essential to draw roadmap properly for the green transition.

The notion of green jobs refers to the people working for the beneficiary of the environment and ecological sustainability. There is no consensus on the definition of green jobs, thus there are different approaches, definitions and evaluation criteria on what a green job is. The ILO defines green jobs as: "… work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high-efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution" (Renner et al, 2008, p.3).

In order to outline a successful framework for the green economy roadmap, understanding the whole concept, its necessary conditions, driver sectors, policies and good practices is significant.

The aim of the study is to provide a conceptual framework for grasping aspects of green jobs in order to gain the ability to distinguish between green and non-green economic activities. Analyzing key drivers, sectors and occupation profiles for green jobs are the main objectives of the study. Furthermore, green skills and decent work terms as a supportive concept for green jobs are investigated in order to understand the needs of the labor market. Due to the fact that there is an increasing demand for information on green employment, this study tries to enlighten baseline measurements methodologies to grasp trends in the number, type, and distribution of green jobs. Another objective is to present the practices of other countries to develop a policy roadmap. As a case, evaluating the current situation of the key driver sector and employment priorities in the context of Turkey is a key issue within the selected methodology. The study describes the profile of Turkish green economy and job portfolio regarding legal policy. Examining opportunities and challenges with respect to green vision in the labor market is the expected outcome of the thesis.

The motivation of this study is to fill in the missing parts of the framework of Turkey, in terms of the transition of the labor market into the green market. In Turkey, as a developing country, there is less intention to produce the notion with a green vision. Also, there is no widely agreed definition in the country`s profile. This study acts as a guide for analyzing leading studies and best practices from other counties. Furthermore, the national and local level deficiency, as well as opportunities regarding green jobs development, are revealed in the context of Turkey. As a result, this study attempts to act as a guide in order to create a strategy or roadmap in a national and local governance context. This study supplies initial mapping equivalent to the size and structure of the Turkish economy regarding the pursuit of the green jobs. For these purposes, the research questions are set up as below:

- What are the key driver sectors for creating green jobs?
- What are the practical experiences in the development of green jobs around the world?
- What is the Turkish economy and employment profile in terms of green jobs?
- Does Turkey's national and local legal context support green jobs?
- What is the sectorial situation in the decent work context in Turkey?
- What is the potential for creating green jobs in Turkey?
- Which kind of policies should be structured for green jobs development?

1.2 Methodology

The research of the thesis tends to be more concerned with gaining an understanding of the subject of green jobs. The methodology of this study is based on reviewing the literature and developing an exploratory study with respect to the application of the ILO's methodological framework.

In this context, first of all, the literature review was conducted on the concept of green jobs. In order to draw a conceptual framework, different definitions by various researchers and institutions were compiled and these definitions were categorized into subject-related groups. In the literature review part, the aim was to have a general information and leverage level of understanding. Related literature was collected to sort out emerging green concepts. Also, with the literature, strategies for green job development in terms of finance and for creating a mindset to find out possible solutions were scanned.

The literature includes mainly reports and articles published by international organizations related to sustainability in the economy. The literature was searched with keywords such as the green economy, sustainable green economic development, green jobs, green jobs assessment, and skills for green jobs. Also, the previous theses and articles based on Turkish context related to the study were searched from the archive of the National Thesis Centre of the Council of Higher Education.

ILO has become prominent on the subject of green jobs. Within the collaboration of other important organizations like UNEP, IOE, ITUC, Green Jobs Initiative, “Green Jobs: Towards decent work in a sustainable, low-carbon world” was published. After that, ILO released several studies named as Skills for Green Jobs, Decent Work and launch country program for assessment of green jobs potential of countries. This study compiled all the reports and deployed a methodology which was produced by ILO for country programs. Based on the green jobs definition, the sectorial outlook was scanned and environmental-friendly subsectors to accelerate the creation of green jobs were detected. Decent work indicators were used for the assessment part of the study. Estimation of the potential of Turkey was depended on assumed employment factors. Compiling the result was the final part of the ILO country program methodology flow.

In the Turkish case, preliminary data were collected from national or international web-based sources like international agencies, related associations, etc. Additionally, to draw a frame for the status of Turkey, statistical information, reports, and other information were collected from related national sources.

1.3 Content

This thesis is organized into five chapters including the introduction part that mentions the general global concern. Introduction part includes sub-subjects as the purpose of the study with research questions, methodology, and content of the study.

After the Introduction part, the second chapter presents the main theoretical background about the emerging concept of “green jobs” through literature review. In the second part, the focus is given on the definitions about the revealed approaches to grasping the meaning correctly for the reason that “green” and “sustainability” is perceived as buzzwords especially in the economy. Following, green economy, green growth, and green jobs are outlined in terms of their meaning and historical backgrounds. In addition, green skills and decent work terms are examined as supporting notions in developing green jobs.

Afterward, the third chapter goes deeper into the general framework of a green job. Occupational and sectoral categories are examined. In addition, the third part sorts out the range of methods generated by international organizations to bring numbers into discussions. Some practices and strategic roadmaps from different countries are highlighted to catch the initial steps needed for structuring a national policy framework. As for the last point of chapter three, different perspectives about the definition and process of the green jobs development is served as a dark side of the notion.

After giving fundamental information, chapter four is examined Turkey as a developing country. Firstly, the profile of the labor force is investigated. Then, the legal policy framework is explored with the purpose of finding a supportive statement for green jobs development. Key sectors are outlined and assessed following the framework of ILO methodology. The potentials of each key sector are examined for green jobs estimations.

The last section of the study is served as the fifth chapter. Within the conclusion part, the whole process is outlined to shed light on Turkey’s current position. It is emphasized that the role of the local and central government in cooperation with the private sector, initiatives and investments are essential for awareness of the green jobs potential. Furthermore, barriers and limitations are discussed in the next steps of research and data collection. Finally, some steps are suggested to initiate green jobs development in the national policy framework.

2. HISTORICAL BACKGROUND OF GREEN KEY APPROACHES

From the beginning of the pre-industrial revolution to the present, so many changes in the environment have been made by the people. As a result, disruption of natural resources holds the top position in the global agenda. After the industrial revolution, environmental effects began to increase including the greenhouse gas effect, air, and water pollution. Through the 20th-century people got aware of those problems (Bayramoğlu, 2011). Besides finding a solution for environmental problems, economic and social dimensions are also in needed of an improvement to provide the balance with the environment. Green jobs and decent work policies incorporate all these dimensions in itself. However, creating green jobs and decent work policies require an assessment of the mainstream concepts and network in order to depict a robust policy structure.

This chapter of the study tries to give an accurate picture for the evolving concepts that green jobs and decent work terms have derived from. The theoretical context for the study arises from reviewing the literature with the purpose of picturing the connection between sustainable development, green growth, green economy, green job, green skills and decent work.

The concept of sustainability has become a fashionable concept and it is used in almost every report even if it is still a difficult task in practice. Basically, the notion of sustainability means economic and social development without damaging the environment (Newman and Kenworthy, 1999). In 1987, the World Commission on Environment and Development (WCED) released the report named Our Common Future, which was a milestone in the concept of sustainability. The term ‘sustainable development’ was also explained in the report as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987, p.16). Afterward, the notion of sustainable development was shifted towards becoming a global vision and has been put on the global as well as national agendas.

In 1992, World leaders gathered at the UN Conference on Environment and Development (UNCED), named as the Earth Summit that took place in Rio de Janeiro. The common agenda was related to environmental damage that is caused by economic development, critiques on well-being, and the survival of the present and the future generations (Nal, 2008). Concluding the conference, the call was declared for governments to develop national strategies and action plans for sustainable development comprising policy measures. Rio Declaration and Agenda 21 were two main agreements adopted in the summit (Allen and Clouth, 2012).

In 2000, another important meeting was held to assign the United Nations Millennium Declaration, which provided a new global consensus at the UN Millennium Summit. Within declaration, Millennium Development Goals (MDGs) set out eight main goals with a deadline up to 2015. To meet the aspiration, 189 leaders of the countries committed the declaration with specific targets and indicators (URL-5). The eight goals include combating poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women. The Eight Millennium Development Goals are: to eradicate extreme poverty and hunger; to achieve universal primary education; to promote gender equality and empower women; to reduce child mortality; to improve maternal health; to combat HIV/AIDS, malaria, and other diseases; to ensure environmental sustainability; and to develop a global partnership for development that illustrated below Figure 2.1 (URL-4).

Figure 2.1 : Millennium development goals (URL-4).

The 2002 World Summit on Sustainable Development held in Johannesburg, South Africa strengthened the three dimensions of sustainable development as those related to environmental, social, and economic dimensions. Although each of these three dimension are different study fields, the ideal expectation is to integrate them to each other cumulatively, regarding all three different perspectives and objectives of sustainability (Nal, 2008).

In 2012, the United Nations Conference on Sustainable Development also named as Rio+20 took place in Brazil. The target of the member states was to concentrate on implementation of sustainable development. They decided to develop Sustainable Development Goals (SDGs) which have a broader scope compared to Millennium Development Goals. Indeed, leading green economy policies were also announced. 2015 is the year that COP 21 and the Paris Agreement was held. The heads of states and governments set a path to engage sustainable development through the 2030 Agenda for Sustainable Development. Along with the agenda, a set of 17 Sustainable Development Goals and 169 associated targets entered into force in 2016 (URL-3).

Even if they are not legally binding, SDGs are expected to be fulfilled by governments for the next 15 years. Indeed, SDGs provide a strategical framework for every country that should be followed. They offer a roadmap to tackle with the primary problems with an intention to achieve inequalities, economic growth, decent jobs, cities and sustainable consumption and production (URL-3). SDGs that are a part of the new broader agenda is demonstrated in Figure 2.2 below.

Figure 2.2 : Sustainable development goals (URL-18).

Particularly in the Goal 8, it is expressed to “promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” which is directly related to balancing the economic growth with environmental and social problems. Specific targets under the Goal 8 concentrate on tackling with youth unemployment. The purpose of the targets under the Goal 8 is to guide productive activities, decent job creation, entrepreneurship, creativity and to encourage small and medium-sized enterprises. Indeed, targets demonstrate equity issues amongst women, men, young and people with disabilities, regarding labor rights and conditions. In fact, all targets under the economic growth aims to lead the development of societies and to increase the quality of life while achieving efficiency in natural resources (URL-4). However, the green economy and green jobs notions depend on a broader scope rather than depending on only economic growth. They are not only related with economic growth but also with protecting the environment as mentioned in the Goals 13, 14, 15.

Many steps are taken to strengthen the sustainable development notion and related practices. These have still been ongoing with international agreements that can be seen in Figure 2.3.

Figure 2.3 : Timeline of progress about sustainable development (Prepared by the author).

Meanwhile, the journey of improving the sustainable development, the terms of green growth and green economy were demonstrated to cover continuous concerns such as global energy scarcity, food and financial crises and warnings from experts that underline the danger in society. While attempts are still continuing, in the late 2000s green jobs and skills are becoming popular terms, especially in the developed countries, to encompass the warnings. The following sections contain more detail outlook on the meanings and emerging steps of the mentioned concepts.

2.1 Green Economy

In 1989, the green economy phrase was firstly used in Blueprint for a Green Economy report, which was developed for the Government of the United Kingdom. The report empowered UK Government's insight into sustainable development and its implications. However, there was no detailed explanation about green economy concept beyond the title of the report.

In 1991 and 1994, as a sequel, the second and third report was published entitled as Blueprint 2: Greening the world economy and Blueprint 3: Measuring Sustainable Development. The theme of the first report was about supporting economy sector and environmental policies together; the sequels were developed for broadening the vision on global problems (Allen and Clouth, 2012).

Due to the financial crisis and concerns in 2008, urgent calls for changing the pattern of production and consumption have been made. Therefore, the green economy concept has attracted attention and UNEP has promoted the concept of green stimulus packages and defined specific areas to address green economy. UNEP established Green Economy Initiatives to accelerate practices such as exploring investments, creating policies and preparing reports. In 2009, the initiative released the Global Green New Deal (GGND) report that elaborates on three objectives: economic recovery, poverty eradication, reduced carbon emission and ecosystem degradation (EMG, 2011).

Green economy studies have accelerated with many publications mainly published by UNEP. Although many studies follow the definition of UNEP, there are different definitions for green economy in different publications due to the lack of an agreed definition. For instance, the well-known definition that belongs to UNEP defines the green economy as "one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. It is low carbon, resource efficient, and socially inclusive" (UNEP, 2011, p.2). Green Economy Coalition, which is a group of NGOs, interprets the green economy as "a resilient economy that provides a better quality of life for all within the ecological limits of the planet." (Allen and Clouth, 2012). Other definitions are presented below in Table 2.1

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Table 2.1 : Definitions of green economy derived from different sources.

Source	Definition
(UNEP, 2011, p.2)	"One that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. It is low carbon, resource efficient, and socially inclusive. In a green economy, growth in income and employment should be driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services"
Green Economy Coalition (Url-30)	"Green economy is a resilient economy that provides a better quality of life for all within the ecological limits of the planet."
(International Chamber of Commerce, 2011, p.2)	"Green economy is described as an economy in which economic growth and environmental responsibility work together in a mutually reinforcing fashion while supporting progress on social development."
The government of South Africa, 2011 (Economic Development Department, Republic of South Africa, 2011)	"The green economy involves largely new economic activities and must provide an important entry-point for broad-based black economic empowerment, addressing the needs of women and youth entrepreneurs and offering opportunities for enterprises in the social economy"
Canadian Institute, 2011 (Webb and Esakin, 2011)	"Canadians are approaching Green Economy concepts from different reference points including: concern over climate change; interest in leveraging environmental and economic gains; a realization that this direction makes economic sense and appeals to citizens; seeing an opportunity for innovation that addresses the world's needs; and a desire to diversify economies and minimize risk. In responding to a list of potential principles of a Green Economy, participants emphasized ensuring fairness and equity and addressing unjust disparities; systems-based and holistic, integrating all three spheres of sustainability; and strengthening resilience and reducing vulnerability."
Rio+20 Objectives and Themes of the Conference - (UNCSD, 2012)	"Green economy can be seen as a lens for focusing on and seizing opportunities to advance economic and environmental goals simultaneously."
(Danish 92 Group, 2012, p.6)	"The Green Economy is not a state but a process of transformation and a constant dynamic progression. The Green Economy does away with the systemic distortions and disfunctionalities of the current mainstream economy and results in human well-being and equitable access to opportunity for all people while safeguarding environmental and economic integrity in order to remain within the planet's finite carrying capacity. The economy cannot be green without being equitable"

When comparing all the definitions above, it is clear that green economy incorporates environmental protection with a social emphasis. Although many efforts are intensified for the interpretation of what the green economy is, they provide limited steps that need to be followed in the implementation part. Recently, publications are getting around a set of guiding principles (Allen, 2012).

Based on the publication of a green economy guidebook, principles of green economy derived by many agreements and studies predominantly concentrate on achieving sustainable development. It is interesting that, most of them express social dimension with underlying job creation. Mostly, green economy principles are common and listed in the following (Allen, 2012):

- The green economy is a means for achieving sustainable development.
- The green economy should create decent work and green jobs.
- The green economy is a resource and energy efficient.
- The green economy respects planetary boundaries or ecological limits or scarcity.
- The green economy uses integrated decision making.
- The green economy measures progress beyond GDP using appropriate indicators/metrics.
- The green economy is equitable, fair and just – between and within countries and between generations.
- The green economy protects biodiversity and ecosystems.
- The green economy delivers poverty reduction, well-being, livelihoods, social protection and access to essential services.
- The green economy improves governance and the rule of law. It is inclusive; democratic; participatory; accountable; transparent; and stable.
- The green economy internalizes externalities.

Governments and leaders emphasize the need for appreciating social dimension of sustainable development as well as environmental and economic dimensions while revealing the principles of the green economy in many international platforms such as

Rio+20. Regarding the decreasing the effects of climate change on the economy, a shift towards a green economy is seen as a necessity. It is expected not only to prevent environmental degradation but also to leverage growth by creating more and better jobs and fight for unemployment and poverty. Thus, these principles are expected to guide policymakers in the implementation of green economy (Allen, 2012).

The green economy seeks to drive GDP growth and jobs creation through shifting investments towards clean technologies and natural capital as well as human resources and social institutions. It focuses on the shift in public and private investments as a decisive instrument to achieve growth, environmental improvement, poverty eradication and social equity, with policy reforms supporting this shift. In a green economy, social dimensions are considered as important aspects for new green investments (Fedrigo-Fazio and Patrick, 2012).

2.2 Green Growth

The notion of green growth was firstly expressed during the 5th Ministerial Conference on Environment and Development (MCED) in Asia and the Pacific that was organized by Economic and Social Commission for Asia and the Pacific on March, 2005. During the international level discussions, the conference agreed that green growth approach is necessary for supporting environmental sustainability. They believed that the vision based on the perception of "grow first, clean later" should be changed towards supporting green growth (ESCAP, 2005).

Similarly, with green economy concerns, to enhance the balance between economic growth and environmental sustainability is a key strategy, that is compiled attention as a way out current economic circumstances and 2008 financial crisis (Huberty et al, 2011). Although green growth is primarily focused on overcoming the financial crisis and creating new engines for economic growth, the urgent challenges of the environmental degradation are taken into consideration as well. They realized that the climate change effects cannot be ignored (OECD, 2009).

Republic of Korea (RoK) was a pioneer country to adopt low carbon green growth as a development vision, which was later evolved to National Strategy for Green Growth and Five-Year Plan for Green Growth in 2009, as can be followed in Figure 2.4. The scope of the green growth vision includes: "mitigate climate change and promote energy independence, create new engines for economic growth, improve the quality of life and enhance the country's international standing" (UN ESCAP, 2012). In the year 2009, the Green New Deal program and Presidential Committee on Green Growth were established that are incorporated in national policy. Through these steps, budget, investments and detailed tasks are commissioned to ministers and local government representatives, and the issue of coordination between key actor groups have been clarified. RoK have continued to their studies to improve their green growth strategy and carried it to the political leadership level as a national priority. Then, The Framework Act on Low Carbon, Green Growth came into force in 2010. According to this act (2010), 30 percent of carbon emission reduction was set as the 2020 target in the Republic of Korea (UN ESCAP, 2012).

Figure 2.4 : Timeline of green growth initiatives in the Republic of Korea (Prepared by the author based on UN ESCAP, 2012).

On an international level, the OECD Ministerial Council Meeting in 2009, which comprises 30 members, released a declaration to express that green and growth are closely associated. Within the declaration, the strategy of green growth was expected to be developed with a comprehensive approach by OECD. Then, OECD has a major role in supporting green growth for countries especially in implementation processes (URL-6).

In 2010, the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) countries took part in Incheon Declaration on Green Growth with the scope of pursuing green growth strategies. The intention to strengthen the strategies was expressed in 6th MCED Declaration as well. Another action was to launch Global Green Growth Institute (GGGI), which is a nonprofit foundation. GGGI has combined all efforts with one focus which is identified as spreading the green growth approach as a new model of economic growth, with targeting poverty reduction, job creation, social inclusion, environmental sustainability, climate change mitigation, biodiversity loss, and security of access to clean energy and water. Indeed, in the same year, at the

G20 Seoul Summit, leaders agreed on green growth as a part of sustainable development with the ability to lift many sectors (URL-6).

In 2012, another initiative was established named as Green Growth Knowledge Platform (GGKP). The platform aims to fill the knowledge gap in green growth with the help of many experts and organizations from all over the world. As an international network, GGKP provides collaboration. Indeed, the platform has a role as a guide by serving many tools including policy guidance, best cases, data needed for shifting to green economy. The platform was launched with the support from Global Green Growth Institute, the Organisation for Economic Co-operation and Development (OECD), the United Nations Environment Program and the World Bank (URL-6).

Due to the fact that many international organizations, think tanks and academics aimed to expand the theory and practices about green growth, different definitions can be found in publications. Below, detected definitions are listed in Table 2.2.

Table 2.2 : Definitions of green growth derived from different sources.

Source	Definition
RoK Framework Act on Low Carbon, Green Growth (Republic of Korea, 2010, p.33)	"Growth achieved by saving and using energy and resources efficiently to reduce climate change and damage to the environment, securing new growth engines through research and development of green technology, creating new job opportunities, and achieving harmony between the economy and environment "
OECD, 2011, p.4	"Fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies."
World Bank (Hallegatte, 2011, p.3)	"Green growth is about making growth processes resource-efficient, cleaner and more resilient without necessarily slowing them. Development that is green [which here means resources-efficient], clean and resilient"
Republic of Rwanda, 2011, p.xiv	"An emerging concept that recognizes that environmental protection is a driver of global and national economic development. It refocuses society on achieving qualitative growth rather than simply increasing GDP."
Green Growth Leaders (Huberty, et al, 2011, p.6)	Means "job creation or GDP growth compatible with or driven by actions to reduce greenhouse gasses."
World Bank, 2012, p.2	"It is growth that is efficient in its use of natural resources, clean in that it minimizes pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of environmental management and natural capital in preventing physical disasters. And this growth needs to be inclusive. Inclusive green growth aims to operationalize sustainable development by reconciling developing countries' urgent need for rapid growth and poverty alleviation with the need to avoid irreversible and costly environmental damage"

Table 2.2 (continued) : Definitions of green growth derived from different sources.

Source	Definition
UN ESCAP, 2012	"Green growth as understood by ESCAP has four main features: i) investing in natural capital, ii) greening of the economy by improving the efficiency of using natural resources and ecosystem services, iii) strengthening environmental management and promoting environmental goods and services and iv) generating a double dividend for the economy and the environment"
Global Green Growth Institute (GGGI) (URL-6)	"GGGI's green growth definition emphasizes the importance of economic growth for development and poverty reduction, together with the importance of environmental sustainability and the social inclusion, for the sustenance of growth and the achievement of sustainable development. Green growth is a development approach that seeks to deliver economic growth that is both environmentally sustainable and socially inclusive. It seeks opportunities for economic growth that are low-carbon and climate resilient, prevents or remediate pollution, maintains healthy and productive ecosystems, and create green jobs, reduce poverty and enhance social inclusion."

When all these descriptions are taken into consideration, it is seen that the aim of the green growth approach is to enhance the green economy and sustainable development. As many publications mentioned, green growth approach does not compete with sustainable development. It is a kind of practice for achieving progress for sustainable development with economic and environmental pillars in particular (World Bank, 2012).

Green growth is similar to green economy. While green means the protection of natural resources efficiently, growth is associated with the expansion of economy in order to meet need of the growing population and rising development aspirations. Besides, low carbon and social inclusion are the desired targets in the green growth approach (EMG, 2011). However, the interpretation and targets can be different according to the institutions or nations. Strategies for green growth should concentrate on institutional capacity, level of development, social structure, environmental pressure in the country boundaries. As different challenges and opportunities are seen in different contexts, OECD offers that there is no one size to fit all approach. The strategies should vary while every content needs to be considered within their own contexts and the scope of sustainability (URL-7).

2.3 Green Jobs

The notion of green jobs refers to the changes in the employment pattern of the labor market. It can be deduced from all publications that, there are two points that leads to the development of green jobs.

One reason for developing the term ‘green job’ is a consequence of the green economy transition process. The transition pressure comes from tackling with climate change related problems. In this direction, there is a need to change the way of consumption and production patterns. Climate change leads to question the economic development model. It changes the way of life and the habits that causes an indirect effect. On the other hand, new business and workforce areas are needed to protect the environment while growing the economy because of the direct effects of climate change on the economy. All in all, climate change also affects the labor market directly and indirectly (Martinez-Fernandez et al., 2010).

Martinez-Fernandez et al. (2010) revealed the impacts of climate change on businesses and workforce in three ways: changes in consumer habits, direct impacts on natural and built environments and impacts from regulations as illustrated below in Figure 2.5.

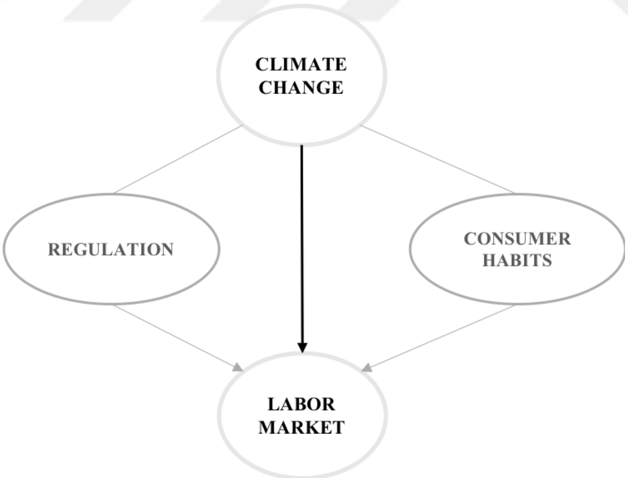


Figure 2.5 : Impacts of climate change on the labor market (Martinez-Fernandez et al, 2010, p.7).

One of the well-known reports about green jobs mentioned about the changes in labor market after the regulations and sustainable economic policies came into force in four different categories (Renner et al, 2008).

- New jobs will be appeared, such as in the manufacturing of pollution-control devices, management of renewable energy and etc.

- Some jobs will be shifting that existing employment in the conventional pattern will be upgraded to green jobs such as shifting from fossil fuels to renewable energy or from landfilling and waste incineration to recycling.
- Certain jobs may be disappeared without direct replacement such as when packaging materials are discouraged or banned and their production has stopped.
- Existing professions will be transformed and redefined through the addition of green work methods, profiles and skill sets.

ILO (2016) introduced the effects on labor market pattern with concept named shades of green. The concept named shades of green explains direct, indirect and induced jobs affected by transition to green economy. All sectors will be transforming differently to become green and sustainable. Facing the scenario, new job categories will come into working environments, some sectors will transform and some of them will be eliminated.

Another reason for leading green jobs concept is related to complex issues such as meeting basic human rights and the value of life. Due to the fact that there are uneven conditions in population and economic development, unemployment problems have appeared, especially for developing countries and third world countries that are struggling for meeting the desired aspirations about the quality of life standards. Therefore, green jobs aim to be decent (Başol, 2016).

Therefore, green jobs are constituted by two main concepts. The first concern is to preserve the environment and decrease the degradation level, while the other concern is to supply decent jobs opportunities. Transformation to green is expected to improve the health of the workforce as well as the social inclusion (ILO, 2016). It can be said that, it is necessary to consider both of the criteria when talking about green jobs (Başol, 2016).

Although there are no widely accepted definition, generally green jobs are considered as decent jobs. ILO promotes green jobs to create decent employment opportunities, to supply resource efficiency and to shape sustainable cities (URL-8). To some extent, ILO (2011) specified the green jobs that reduce the impacts on the environment while supporting society to handle climate change effects. Indeed, the terms of decent work and social inclusion engage with the definition provided by ILO. Definition of ILO covers a comprehensive approach: “Jobs are green when they help reduce negative environmental impact ultimately leading to environmentally, economically, and socially sustainable enterprises and economies. More precisely green jobs are decent jobs that: Reduce consumption of energy and raw materials; limit greenhouse gas emissions; minimize waste and pollution, and protect and restore ecosystems”. Regarding this definition, ILO states that environmental and social aspect of green jobs have the same weight and they are inseparable (Renner et al,2008).

There are several definition attempts among academicians, international institutions, and governments thanks to the increasing awareness. Some researchers state that green jobs protect environmental and natural resources, mitigate the climate change effects and ensure energy security (Peters et al, 2011). Falxa-Raymond et al. (2013) remarked the green jobs with decent job standards. In the content of the definition, low-income workers who have environmental priorities are promoted.

Another focus on green jobs was highlighted in the World Summit on Sustainable Development (WWSD) due to the collaboration of UNEP and ILO. Also, the cooperation between UNEP, ILO, the International Trade Union Confederation (ITUC) and International Employers Organization (IOE) opened the new stage for green jobs research that flourished by a report released in 2008 (UNEP, 2008). The report is called ‘Green Jobs: Towards decent work in a sustainable, low carbon world’ that is also known as the first comprehensive study. In this study, green jobs are defined as: “… work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high-efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution.” (Renner et al, 2008, p.3).

The other definitions derived from the sources in the literature are shown below in Table 2.3.

Table 2.3 : Definitions of green jobs derived from sources.

Source	Definition
The Bureau of Labor Statistics (BLS) (URL-12)	BLS classifies "jobs involved in economic activities that help protect or restore the environment or conserve natural resources" as green jobs, which includes recycling, pollution reduction, organic farming.
Apollo Alliance (Alliance, A., 2008, p. 3)	"Green-collar jobs are well-paid career track jobs that contribute directly to preserving or enhancing environmental quality. Like traditional blue-collar jobs, green-collar jobs range from low-skill, entry-level positions to high-skill, higher-paid jobs, and include opportunities for advancement in both skills and wages."
US White House Task Force on the Middle Class (Office of the Vice President, 2009a, p. 2).	"Green jobs involve some tasks associated with improving the environment, including reducing carbon emissions and creating and/or using energy more efficiently; they provide a sustainable family wage, health and retirement benefits, and decent working conditions; and they should be available to diverse workers from across the spectrum of race, gender and ethnicity."
Michigan Department of Energy, Labour and Economic Growth (DELEG, 2009, p. 4)	"Green jobs are jobs directly involved in generating or supporting a firm's green-related products or services. The state's green economy is defined as being comprised of industries that provide products or services in five areas: agriculture and natural resource conservation, clean transportation, increased energy efficiency, pollution prevention or environmental cleanup and, renewable energy production."
ILO (Strietska-Ilina et al, 2011, p.4)	"Green jobs are defined as jobs that reduce the environmental impact of enterprises and economic sectors. This definition covers work in agriculture, industry, services, and administration that contributes to preserving or restoring the quality of the environment while also meeting the criteria for decent work – adequate wages, safe conditions, workers' rights, social dialogue and social protection. It implies in its inclusivity and breadth that every job can potentially become greener. The understanding of green jobs also varies from one country to another. Ultimately, countries will need to compose their own national definitions and set thresholds for practices considered green or non-green."

Green jobs were referred as different types of jobs that depend on the environment or are created, substituted or redefined during the transition process towards green economy. It can be thought that, green jobs seek environmental protection and they are compatible with climate change policies. Initially, green jobs definitions seek a place with the environmental focus on occupations and skills, for instance, employment in industries provide environmentally friendly products and services. Eventually, the scope of green jobs was extended to cover all kind of jobs related to climate change adaptation and mitigation. This process contributed to mutual acquisition in economic development activities that belong to the greening process and it contains a governance dimension at the same time (Martinez-Fernandez, et al, 2010).

Policies under green economy and green growth approaches included that the labor market and economic development processes of countries provide opportunities for green job creation, skill development, and decent jobs. As many leaders have been willing to adapt their economy to a greener one, they eager to apply strategies for a developed green economy or green growth. Supportively, stimulus packages have highlighted green programs in order to create employment growth to tackle with the financial crisis. Nevertheless, due to the 2008 financial crisis, attentions have increased the awareness about potential strategies related to green jobs that can contribute smooth transition to more sustainable production and consumption pattern (AFD, 2015).

UNEP and ILO highlighted that the transition to sustainable and low-carbon economy come up with many green jobs in almost all sectors, and the potential of green jobs is very promising for economic development. Indeed, a global partnership established between ILO, UNEP and International Trade Union Confederation (ITUC) in 2007, and by joining the International Organization of Employers (IOE) in 2008, that is also called as The Green Jobs Initiative. This platform helps countries to develop policies and effective programs that support green economy, green jobs, and decent work as well as the promotion of equity. Green jobs constitute a very dynamic research area and the studies should evaluate green jobs promotion depending on the national policy context (Renner et al, 2008).

ILO has operated the Green Jobs Program that promotes green jobs creation in counties through research since 2009. Studies under country case include capacity building, knowledge sharing and provision of technical expertise with strategic outcomes. They provide acknowledgment about green jobs and draw a roadmap for turning the opportunities into reality. Country-level initiatives have a direct impact on raising awareness on the assessment of the green jobs potential in many countries, such as Malaysia, Mauritius, China, Zambia, South Africa, Thailand, Bangkok (ILO, 2013).

ILO’s green jobs approach contributes to prioritization of environmental aspects and it can be promoted in all sectors from emerging sectors to traditional ones. The approach should be embedded with increasing energy efficiency, decreasing waste and pollution, and raising awareness about climate change adaptation (URL-8).

2.4 Green Skills

Danish 92 Group (2012) stated that an equitable green economy will change the employment pattern. They mentioned that some sectors will disappear while new job opportunities will be created. In this point, reskilling, education and training will gain a significant role in preparation of the labor market for green jobs.

After the vision for transition to a greener economy was set, skills and occupation requirements gained an increasing attention. Shifting to green economy started to change the existing labor market profile. As mentioned in the previous section, in the transition process towards green economy and green jobs, not only new job profiles will emerge but also greening the existing job profile will occur (CEDEFOP, 2010).

Greening job profile poses demanding skills. Also, this situation creates a new challenge as the current workforce should be retrained. Skill gaps and shortages have already been faced as the barriers to green job creation (CEDEFOP, 2010). Renner and friends (2008) cited “shortages of skilled labor could put the brakes on green expansion… it is important both to prepare the workforce at large for the skills requirements inherent in green jobs and to ensure that green industries and workplaces do not face a shortage of adequately skilled workers.” In addition, many countries remarked their concerns about the skill gap that they have been facing. For instance, in Germany, a survey, which is conducted in 2007, proved that the renewable industry is suffering from a shortage of qualified workers (Renner et al, 2008, p.26).

It is certain that all businesses and national labor market are trying to establish a green economy structure. Therefore, it is inevitable that greening the skills will be demanded as the next step. Many businesses demand qualified, green skilled workers in order to fulfill their green vision. So, it is important that nations, especially which are in the transition processes, to have the ability to foresee the demand and take immediate steps accordingly. Before taking these steps, understanding the context of green skills is required. Some studies show that green skills are defined with traditional skills worked for environmental goods and services. For example, if a metal worker works for solar panel production, the worker is accepted as having green skills because the worker belongs to a firm which in the energy efficiency sector. The worker is considered as having an effort to preserve the environment (Martinez-Fernandez, C., et al, 2010). According to Michigan states report, some workers are worried about the greening process of basic skills. Thus first step might be filling the knowledge and skill gaps in the existing capacity (DELEG, 2009).

Some studies revealed that green skills related to new skill sets have not taken place in the existing labor market. According to Slingenberg et al (2008), the shifting green economy requires specific skills such as sustainable materials, environmental impact assessment, and management of recycling systems. Filling the skill gap in the brand-new green sectors is a bit challenging task. New skill sets should be embedded into the training and education systems (Martinez-Fernandez, et al, 2010).

CEDEFOP (2012) defined the effects on skills in three categories:

- Demand for some professions appears while some of them disappeared via structural change.
- The new structure of the labor market requires new occupations with qualified skill sets incorporated via training programs.
- Existing workforce learn greening task within own jobs via adjustment about training framework.

IDEA (2010), which has an activity-based approach in green jobs definition, draws their identification of green skills with shades of green approach. According to this approach, skill development is classified as new skills, the transformation of existing skills, and skills that disappeared. This is also shown below in the Table 2.4.

Table 2.4 : Dynamics of skills according to IDEA approach (IDEA, 2010, p.28).

Dynamics of skills	Examples
New skills	"Skills in new jobs e.g. production of windmills, or skills in 'transforming activities' e.g. energy efficiency knowledge in the construction sector, fitting skills for solar panel technologies."
Transformation of skills	"Skills in 'transforming' jobs e.g. increased level of multidisciplinary coordination skills in the construction sector, better insulation skills."
Skills that disappear	"Skills in 'disappearing' jobs e.g. energy generation based on fossil fuels."

ILO's approach also supports the greening of the existing job profiles rather than replace existing jobs in the first place. ILO mentioned that the high demand for green skills has come out as a consequence of the transition to a greener production and business.

ILO introduced Skills for Green Jobs project that is a part of Green Jobs Initiative launched by ILO, UNEP, IOE, and ITUC. Green Jobs Initiative encourages governments, employers, and unions to prioritize the environment and to increase sustainable jobs. Skills for Green Jobs project intends to detect main barriers for skill development required to tackle with climate change (Strietska-Ilina et al, 2011). ILO classified the level of skill changes as the occupational changes through introducing them with examples, as it is shown below in Table 2.5. They assume that four changes can be observed. Some occupations will need no training, while some of them, which are new and emerging occupations, will need a university degree or at least more intensive training.

Table 2.5 : Changes in skills and occupations for green jobs (Strietska-Ilina et al, 2011, p.96).

Degree of skills	Occupational change	Typical skills response	Examples
None	None or only quantitative	None or increased training in existing occupation	A bus driver in CNG buses; national park ranger
Low	Changing established occupation	On-the-job learning or short training courses	Welder in wind turbine production; organic farmer
Medium	Changing established occupation	Short courses or longer continuous training	Energy consultant in the building; car mechanic for electric or CNG cars
High	New and emerging occupation	Initial training, university degree or longer continuous training	Solar energy technician; eco-designer; biofuels technician

Restructuring the economy is directly related to jobs and skills. Although new green sectors require changing skills, they have the potential to convert jobs and skills in traditional production patterns. Regarding this point of view, the green economy has an impact on the different levels of education, on the skills as well as on the type of the job (IDEA, 2010).

All studies show that training adjustments are necessary from low-skilled to high-skilled jobs at different levels due to the raising awareness on the green production systems. Low-skilled and medium-skilled occupations can gain experience on the green jobs with on-the-job training programs. High skilled occupations are in need of a broader training with specific sets of new green skills through new educational programs. Green skills can be considered as knowledge-intensive and they can be obtained through education or experience (Martinez-Fernandez et al, 2010). Indeed, greening skills provides a capacity building. Besides, skill development galvanizes competitiveness and productivity that is desired by all the countries.

2.5 Decent Work

The notion of decent work is not a new concept. It is seen in the content of human rights declarations. In the international agenda, after the 2008 crisis, policymakers increased attention to decent work and improvement of quality of jobs in order to fulfill their sustainable economic growth visions. The notion is raising as a universal objective with Conference on Sustainable Development and UN's 2030 agenda for Sustainable Development. The Goal 8 of the 2030 agenda is called decent work and economic growth. The content of the Goal 8 includes employment creation, social protection, rights at work and social dialogue. The targets under the Goal 8 support inclusive sustainable economic growth while achieving a productive employment and decent work (URL-3). UN Secretary-General Ban Ki-moon expressed the importance of the term by indicating: "experience shows that economic growth, on its own, is not sufficient. We must do more to empower individuals through decent work, support people through social protection, and ensure the voices of the poor and marginalized are heard" in the World Day of Social Justice in 2014 (URL-9).

ILO initiated the early steps for the concept of decent work and developed the notion by adding new programs. After these contributions, the decent work term started to be considered as provision of better quality attributes in the working area. It includes many aspects such as fair income, equality between men and women, security in the workplace, social protection, health insurance, social integration (ILO, 2013).

Pan and his colleagues (2011) embraced the decent work ethos as meeting aspirations of people at workplaces in terms of rights and fairness. Decent work is also associated with peace in society. The aspects of decent work are found in four categories: basic rights and international labor standards; employment and income opportunities; social protection and security; social dialogue.

The European Trade Union Confederation (ETUC) (2007) mentioned about decent work in five principles:

- Cutting of vulnerable employment

- Creating well-organized workplaces where people are fully informed and consulted and have the opportunity to obtain skills
- Supplying legal protection which meets employment standards
- Offering social welfare systems
- Supplying social dialogue

ILO created an agenda for further studies on the decent work regarding job creation, labor rights, social protection and many other crosscutting objectives. ILO Decent Work Agenda gained support from leaders and it was internationally recognized (URL-14). Implications are designed to improve decent work at a national level through capacity building and activities for awareness raising. It facilitates an understanding on the decent work issues for the policymakers and agencies through the contribution of tools and know-how materials. Indeed, the Decent Work Agenda offers an integrated approach to accelerate national sustainable economic visions (URL-9).

Decent Work Agenda outlined four strategic principles by including all types of workers in all economic activities (ILO, 2008):

- Promoting employment with decent and productive attribution
- Enhancing access to social protection
- Respecting main labor standards
- Strengthen social dialogue

ILO took a step forward and established the Decent Work Country Programs (DWCPs) to assist countries. DWCPs aim to encourage nations to build decent work capacity through development strategies. Additionally, they present ILO knowledge and instruments to broaden service for tripartite constituents. Tripartism and social dialogue have a critical role in the planning and implementation processes. The advantage of DWCPs is to create better integration of technical cooperation as well as better coordinate budgetary works. They draw priorities, strategic outcomes in the context of different country dynamics (ILO, 2016a).

Decent work is a way to support productivity. Studies found that companies, which can ensure trust, involvement and skill development, will surely receive productive performance (URL-14).

2.6 Overall Assessment of Emerging Green Concepts

The purpose of sustainable development is identified in three pillars: economic development, environmental protection, and social equity. Over time, efforts to reach these goals lag behind the targets. Meanwhile, warnings on environmental costs have grown. Green growth and green economy concepts have emerged to attract the attention of policy makers to the prevention of negative environmental impacts of the economy without blocking growth. Also, it has witnessed that climate change affects the labor market indirectly. Green employment has revealed this with a green economy and green growth programs. Similar to the other green concepts, green jobs definition is controversial and interpretation of the concept can be different (AFD, 2015).

It is obvious that sustainable development is an umbrella term when compared to the other green key concepts. As pointed out in Figure 2.6 showing the process of sustainable development notion, all green ideas follow the sustainability approach and its targets and they are developed by focusing on creating economic sustainability. There is no clear distinction between the green economy and green growth. Although green growth is dominantly interested in economic expansion, green economy concerns inclusiveness in terms of social aspects. Green jobs are constituted as following green growth. The notion of green jobs led to the development of other concept named green skills, which is one of the aspects of creating green jobs in existing employment profile. ILO, which is a well-known organization to promote green jobs for all countries, develops a framework for the definition of green jobs. The definition generated by ILO attempts to contain decent work concept for meeting aspiration of leveraging human rights besides creating new employment areas. That's why, decent work concept is also revived and adopted as a supporting concept to the term of green jobs (URL-16).

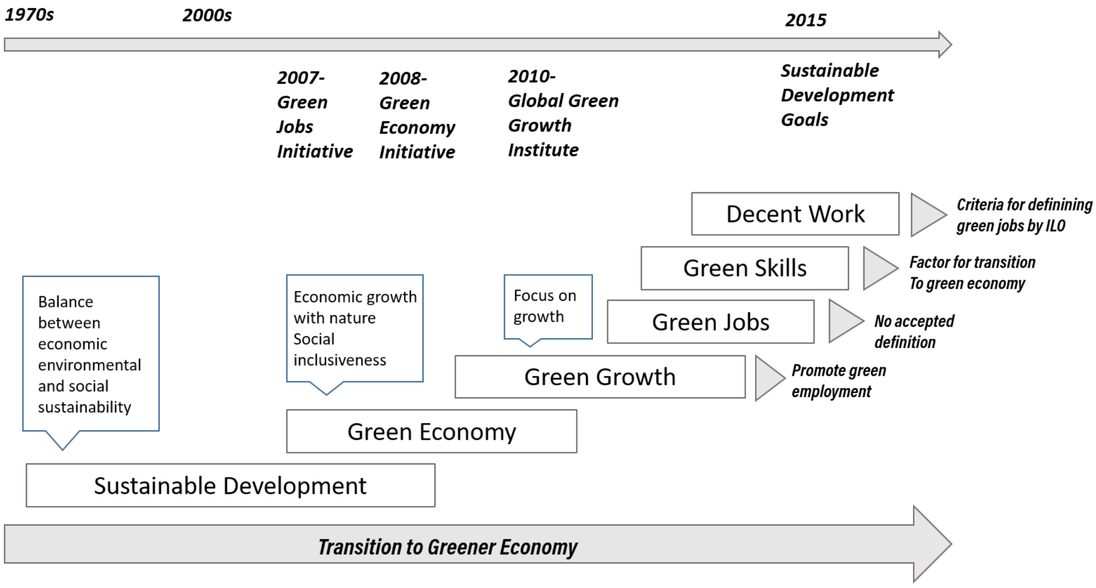


Figure 2.6 : Timeline of emerging green concepts (Prepared by the author based on AFD, 2015).

The concept of green jobs contributes to the preservation of the environment by promoting energy efficiency, achieving resource efficiency and minimizing environmental degradation and pollution. Indeed, green jobs also need to be decent jobs according to ILO. Green jobs can be observed in traditional sectors such as manufacturing or in emerging sectors such as renewable energy. In ILO's approach, green jobs should be distinguished from environmentally friendly sectors even if the sector serves environmentally friendly products or process.

In Figure 2.7, the dashed area in between the three-circle was designated for green jobs. The dashed area represents the intersection of green output employment and green process employment in environmentally friendly sectors and the decent works as the third circle (URL-16). It is important to fulfill the requirement of decent work to be classified as a green job.

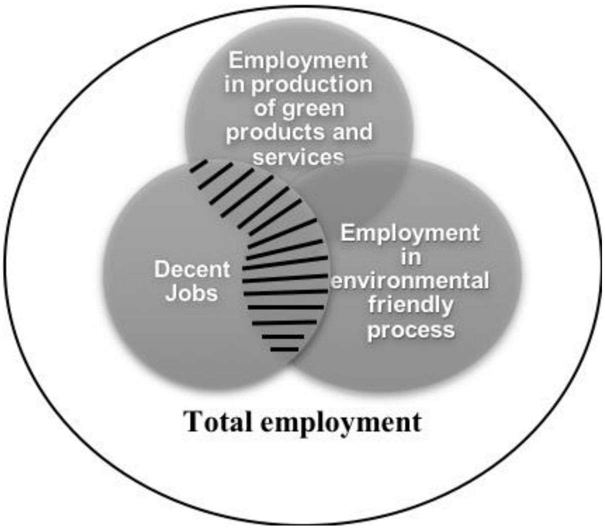


Figure 2.7 : Green jobs cluster (URL-16).

In addition, estimating which jobs are really green lead to conflicts. For instance, in the recycling sector, workers can be employed without labor standards in terms of health and safety, although recycling jobs fulfill the environmental concern and can be accounted as green jobs (EMG, 2011). Environmental concerns in the labor market should both promote decent work and the preservation environment (Renner et al, 2008). Figure 2.8 below, illustrates the relationship between green jobs and decent work.

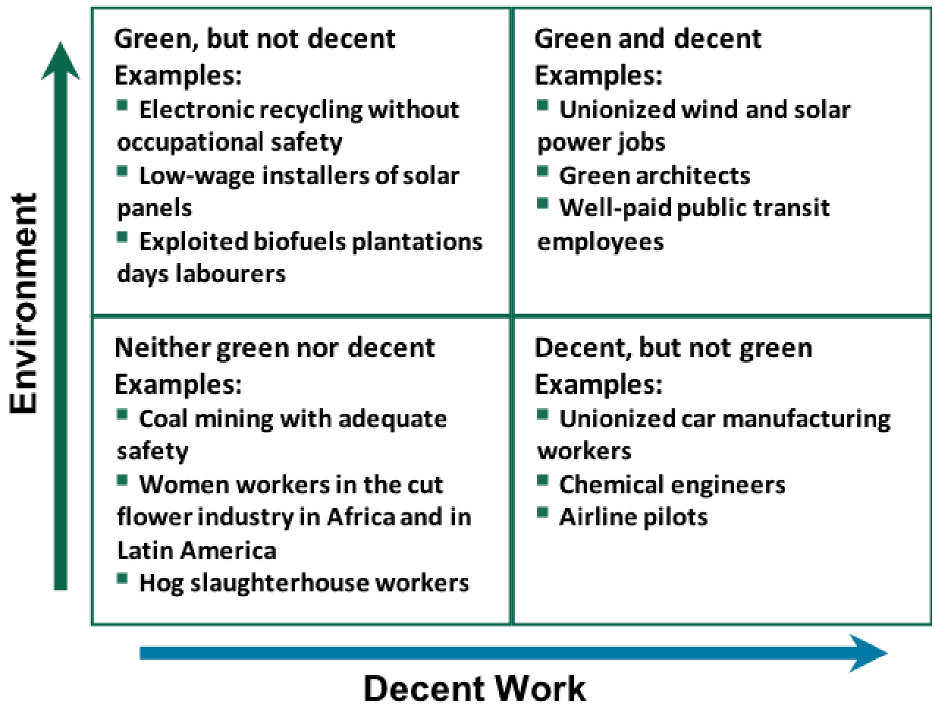


Figure 2.8 : The relationship between green jobs and decent work (Renner et al, 2008, p.40).

Like its definition, there is no clear and recognized indicator to assess the green jobs. On this view, ILO created a technique to assess country's profile using decent work concept, which is based on four pillars: the promotion of employment, enhancing social security, the implementation of labor standards and social dialogue (ILO, 2013).

Van Jones, the founder and president of Green for All, mentioned about the dimension of inclusiveness of green jobs as follows: "blue-collar employment that has been upgraded to better respect the environment; family-supporting, career track, vocational, or trade-level employment in environmentally friendly fields, such as electricians who install solar panels; plumbers who install solar water heaters; farmers engaged" (Office of the Vice President, 2009).

In labor market sectors, attempts related to the shift to green economy and green jobs are depended on skill transformation level. To support the targets and green job policies, which address two main issue including local development and disadvantaged groups such as the young, unemployed and informal economy workers, greening the skills is an important aspect to consider (Renner et al, 2008).

Not all the green jobs are in need of high-level specific skills for fulfilling their purpose. Some other jobs can also be modified with training in transition towards green economy. Some traditional skills can also be transferred to green jobs. ECO Canada (2012) research indicated that environmental works are firstly observed in the four-degree discipline. Secondly, they can be developed through experience or professional training as seen in Figure 2.9.

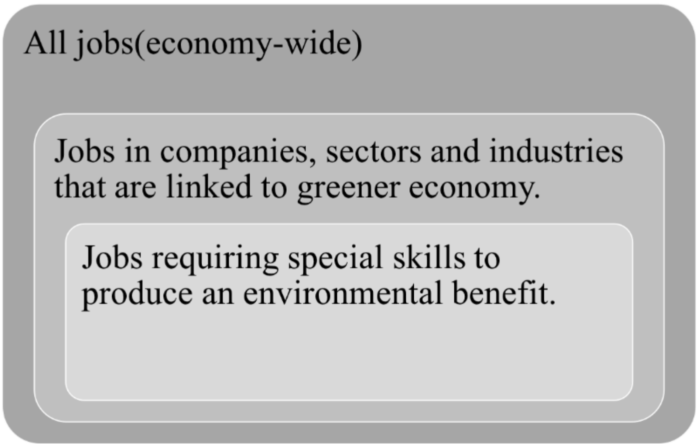


Figure 2.9 : ECO Canada Diagram of green jobs (ECO Canada, 2012, p.5).

Although there are many challenges emerging while developing green concepts, it is inevitable that transition to green economy is desired by all countries. Indeed, the demand for minimizing the effects of climate change is recognized by international agreements. These commitments have increased an attention on the subject of green job creation policies. Green jobs are generally related to protecting ecosystems by reducing unsustainable consumption of resources in economic activities. Besides to the elimination of all kinds of pollution, green jobs are also need to be decent work to provide equity for all people and achieve social sustainability at the same time. Overall, green jobs are essential to respond to important issues that people face recently: minimization of climate change effects for cities, supplying job opportunities to address unemployment problems and deliver basic human right such as gender equality, safety, and security in working arena to boost human development (ILO, 2015).

3. GENERAL FRAMEWORK OF GREEN JOBS AND DEVELOPMENT

Recently, there is a growing attention about renewable energy, coupled with energy efficiency, due to the climate change warnings. The transition to green economy vision has been raised in many public officials and at multiple level of governments as well as businesses. Within the green economy, green job promotion statements started to emerge. Many policymakers follow the green economy policies and green jobs are seen as a major part of the transition. However, this interest leads to a need for the identification of green occupations and skills. It is essential to acknowledge that to what extent the realm of green jobs can support the green economy (Cleary and Kopicki, 2009).

As the global mindset is going to change, the number of green jobs are expected to increase in both developed and developing countries during the transition process towards a low carbon economy. Many studies and reports have remarked that, green jobs opportunities of the green economy are supposed to create new jobs. These studies lead to an increase in awareness levels as well as technical capacity and know-how that is spreading all over the world especially after the United Nations Conference on Sustainable Development (UNCSD) held in 2012 (ILO, 2015). Many institutions take a step towards creating a way to define environmental activities and related occupations although there are little reliable data about number and types of green jobs (Sommers, 2013).

This chapter emphasizes the practical term of green jobs and the importance of sector-based separation in this sense. Following the examples of green jobs in real life, this study expands the methodologies used while designing a strategic roadmap. Key sectors are identified to make a clear acknowledgment on green jobs. This chapter includes identification of the sectors to be accounted as green or potential to be green, the methods to be applied, the policies to be produced in the context of national development roadmaps with limitations and barriers of the concept.

3.1 Activities of Green Jobs and Green Economy

In recent years, it can be seen that renewable energy, energy efficiency, organic agriculture and insulation sectors are trend sectors. Many green occupations are dominant in these sectors. For instance, environmental engineers, environmental consultants, ecological architects, environmental lawyers, workers who produce and construct wind or solar turbines, insulators of buildings, producers of green products are accepted as the green jobs employees (Renner et al, 2008).

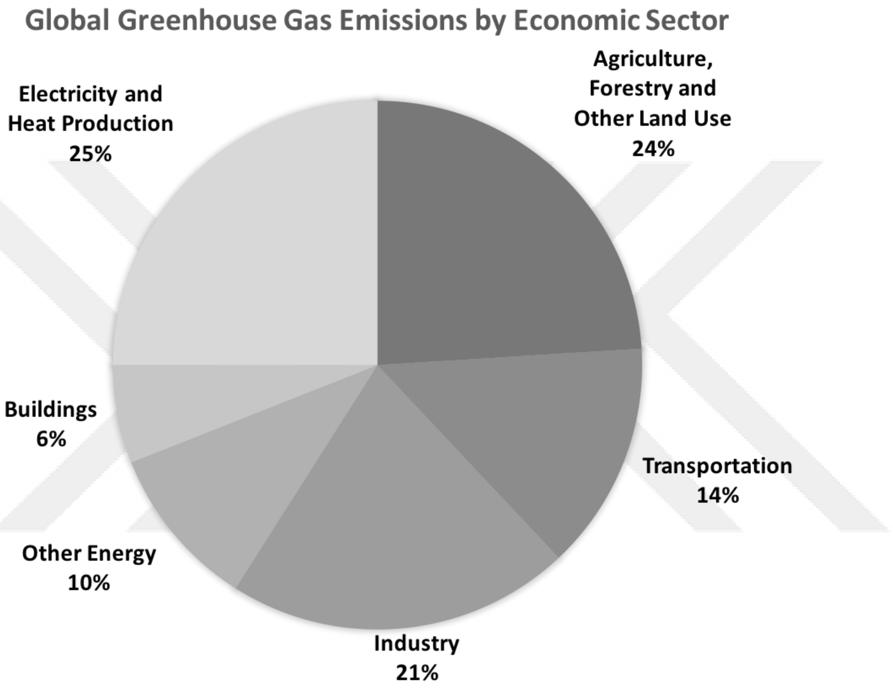


Figure 3.1 : Global greenhouse gas emission from 2010 by main sectors (IPCC, 2014, p.9).

As It is known that green jobs aim at facilitating transition towards low carbon economy and minimizing emissions. Thus, it would be first step to select core sector from most pollutant sectors, then strategies about creation of green jobs can be developed in the selected sector. Although every country has different dynamics in the emission ratio per sector, the energy sector has the highest ratio of releasing greenhouse gases that can be seen in Figure 3.1 (UNEP, 2012a). Thus, green jobs are generally observed in the sectors that are related with increasing energy efficiency.

The Workforce Information Council (WIC) published a report on green jobs that are seen as important in analyzing green economic activity (WIC, 2009). These jobs are classified according to their relationship with the economic activity that can be considered as green. The categories of green jobs include the sectors such as renewable energy and alternative fuels, energy efficiency and conservation, pollution, waste, greenhouse gas management, prevention and reduction, environmental cleanup and remediation, waste clean-up and mitigation, sustainable agriculture, natural resource conservation, education, regulation, compliance, public awareness, training and energy trading (Georgetown University, 2013).

BLS categorized the definition of green jobs to make data collection easier. Besides the definition, the approach gives details and examples of different types of jobs to be involved. The first category (A) of the BLS definition is referred to as “the jobs in businesses that produce goods and provide services that benefit the environment or conserve natural resources” (Sommers, 2013, p.5). These jobs are varied from research and development to maintenance services. Green goods and services are also explained in five categories as shown in Table 3.1:

Table 3.1 : BLS green goods and services categories (Sommers, 2013, p.7).

Category A groups	Explanations
Energy from renewable sources	Electricity, heat, or fuel generated from renewable sources obtained from wind, biomass, geothermal, solar, ocean, hydropower, and landfill gas and municipal solid waste.
Energy efficiency	Energy-efficient equipment, appliances, buildings, and vehicles, as well as products and services that concerns supplying efficiency of energy.
Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse	Reduce or eliminate greenhouse gas emissions, pollutions and waste.
Natural resources conservation	Organic agriculture and sustainable forestry; land management; soil, water, or wildlife conservation; and stormwater management are related to protecting the ecosystem.
Environmental compliance, education and training, and public awareness.	Environmental regulations, education, and training linked to green technologies and practices and any activities to increase public awareness of environmental issues are accounted.

The second category (B) of the BLS definition is referred to as “the jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources.” (Sommers, 2013, p.5). These workers support new green technologies such as renewables, recycling, in the production process. Using green technology is highlighted in all contents of groups (Sommers, 2013).

Besides this research, BLS began to publish green careers section in its website to inform about the occupations. Articles acknowledge on careers in solar power, wind energy, green construction, electric vehicles, recycling, energy auditing, sustainability, environmental remediation, geothermal energy, and biofuels. Occupations can benefit from these series of articles in terms of many subjects such as the technology involved, credentials required and the wage standards to be used (BLS, 2015).

A study focuses on preparation of green jobs for the United States' workforce by concentrating on two sectors at the beginning: energy efficiency and renewable energy. Energy efficiency sector includes retrofitting activities and developing energy efficient products while renewable energy sector contains installing, maintaining of technologies generating energy from wind, solar, geothermal and hydropower. Many workers such as construction workers, cost estimators, financial analysts, computer technicians, accountants, manufacturing workers, truck drivers, salespersons, scientists, engineers can be regarded as green employees if they contribute protecting environment or energy. Even, a metal worker might serve for green services if the worker learns new techniques for implementing wind turbine (Cleary and Kopicki, 2009).

In the building sector, retrofitting and isolation is important for saving energy and they lead to create space for green jobs. From low to moderate training, common occupations can take part in this sector. Electricians, heating/air conditioning installers, carpenters, carpenter assistants, construction equipment operators, roofers, insulation workers, construction managers, building inspectors, auditors, building weatherization occupations, electrical engineers, mechanical engineers, cogeneration construction and operation, measurement and verification technicians, energy management analysts are some examples of both skilled and skill needed green jobs that is included in the building sector (Cleary and Kopicki, 2009).

Wind energy related jobs can vary from entry-level construction laborers to advanced engineers in manufacturing, construction, installation operations and maintenance. These include environmental and energy engineers, iron and steel workers, sheet metal workers, machinists, electrical equipment assemblers, construction equipment operators, industrial truck drivers, industrial production managers, operators, and maintenance technicians (Cleary and Kopicki, 2009).

A study conducted by the Asia Business Council aims to assess the green jobs in the Asia region. They created a method that measures the countries' level in comparison with the others in the subject of green jobs. Also, they enlarged the concept with skill requirements. They categorized green jobs' examples with job requirements as seen in Table 3.2 (Asia Business Council, 2009).

Table 3.2 : Asia Business Council Representative Green Jobs (Asia Business Council, 2009, p.13).

Job Requirements	Does not require green industry-specific skills	Requires green industry-specific skills
Requires four-year university degree or above	Construction engineers Electrical engineers Mechanical engineers Civil engineers Aerodynamic engineers Software engineers Chemical engineers Material scientists Construction managers Industrial production managers Laboratory assistants Investment bankers Venture capitalists	Environmental architects Environmental engineers Photovoltaic engineers Geotechnical engineers Agronomists Water and waste treatment engineers Ecologists Marine biologists Sustainability executives/managers Compliance managers Power grid integration managers Energy efficiency auditors/ inspectors Carbon auditors Pollution monitoring consultants Health and safety officers Agricultural inspectors
Does not require a four-year university degree	Electricians HVAC technicians Heating/air conditioning installers Carpenters, Roofers Insulation workers, Welders Metal Fabricators Machinists, Mechanics Computer-controlled machine operators Engine and equipment assemblers Industrial truck drivers Iron and steelworker Millwrights Material Handlers Laborers Retailers Marketers	Mixing and blending machine operators Sustainable farmers Farm product purchasers Recycling coordinators Carbon traders Ecotour guides Park Rangers

ECO Canada (2010) stated some examples for green jobs and these are stated as sustainability consultant, mechanical engineer, sustainability manager, sustainable packaging teams, manager of sustainable seafood, energy manager, forester, solar panel consultant, biologist, environmental scientist, engineers in site remediation, facilities planner, economist and technician (e.g. wind, solar, environmental). ECO Canada also collected the green job posts within the researched area. Examples for occupations are listed in the top green sectors, which are divided as environmental protection, resources conservation and renewable green energy, as seen in Table 3.3.

Table 3.3 : Occupation examples in top green sectors (ECO Canada, 2012, pp.43-44).

ENVIRONMENTAL PROTECTION	
Occupation	Examples
Manager	Client portfolio manager, Director of health, safety and environment, Environmental consulting project manager, Environmental manager, Manager health, and safety, Municipal infrastructure project manager, Occupational hygienist specialist, Operations manager, Project administrator, Project manager, Technical director
Engineer	Air quality environmental engineer, Water resources engineer/hydrologist, Civil engineer, Environmental engineer Geoenvironmental engineer, Geochemist, Geoscientist, Geotechnical environmental engineer, Health, and safety engineer Hydrogeologist, Process engineer, Project engineer
Technician	Emissions testing field technician, Environmental technician, Erosion control technician, Hazardous materials technologist, Laboratory Technologist, Materials management technician, Materials technicians (soil, concrete & asphalt), Reclamation technologist, Wildlife Biologist
Specialist	Air emissions specialist, GIS analyst coordinator, Industrial monitoring team lead, Mining closure & rehabilitation specialist, Operator - research and testing facility, QA analyst, Reclamation specialist, Technical advisor, Technical analyst infrastructure assessment, a Water specialist
RESOURCE CONSERVATION	
Occupation	Examples
Manager	Resources Manager, Chairperson, Agriculture & Environment Programming, Conservation Crew Leader, Garden Centre Manager & Gardeners Workers, International Project Manager, Managing Leader Environmental Services
Engineer	Municipal Engineering Manager, Water Resources Engineer, Environmental Engineer Geoscientist
Specialist	Beekeeping Intern, Community Engagement Facilitator, Conservation Programs Specialist, Environmental Specialist - Fisheries And Aquatics, GIS Specialist, Invasive Species Specialist, Stewardship & Horticultural Assistant
Farm-Related	Ecological Farming Systems Development Intern, Grass Fed Beef Farm Intern, Organic Farm Apprenticeship Internship, Organic Farm Intern, Organic Gardener, Organic Vegetable Farm Manager, Soil Farm Apprentice, Sustainable Farm Intern
Manager	Business Development Manager, Operations Manager, Project Manager, Quality Control Manager, Regulatory Manager

Table 3.3 (continued) : Occupation examples in top green sectors (ECO Canada, 2012, pp.43-44).

RENEWABLE / GREEN ENERGY	
Occupation	Examples
Engineer	Civil Engineer, Generator Mechanical Design Engineer, Hydro Electrical Engineer, Process Engineer, Solar Manufacturing, Project Engineer, Renewable Power, Turbine & Generator Equipment Support Engineer
Technician	Mechanical Service Technician
Specialist	Security Advisor, Technical Specialist, Training Coordinator, Cogeneration Facility

Pollin et al (2008) conducted a study under the Centre for American Progress and Political Economy Research Institute on strengthening the U.S economy with the green recovery program. The Program expanded the green infrastructure investment area. The fiscal program supports the creation of jobs as well. Table 3.4 demonstrates the green investments and jobs. Green infrastructure areas include: retrofitting buildings, expanding mass transit, construct smart electric grids, wind power, solar power, and biofuels. Some representative jobs identified under the selected sectors, which are illustrated with direct jobs. Although green strategies engage with indirect jobs, in short-term, strategies are considered as being capable of delivering outcomes within a year or more. All the programs aim to accelerate long-term goal in transition to a green economy as well as short-term strategies.

Table 3.4 : Green investments and jobs (Pollin et al, 2008, p.6).

Strategies for Green Economic Investment	Representative Jobs
Building Retrofitting	Electricians, Heating/Air Conditioning Installers, Carpenters, Construction Equipment Operators, Roofers, Insulation Workers, Carpenter Helpers, Industrial Truck Drivers, Construction Managers, Building Inspectors
Mass Transit/Freight Rail	Civil Engineers, Rail Track Layers, Electricians, Welders, Metal Fabricators, Engine Assemblers, Bus Drivers, Dispatchers, Locomotive Engineers, Railroad Conductors
Smart Grid	Computer Software Engineers, Electrical Engineers, Electrical Equipment Assemblers, Electrical Equipment Technicians, Machinists, Team Assemblers, Construction Laborers, Operating Engineers, Electrical Power-Line Installers and Repairers

Table 3.4 (continued) : Green investments and jobs (Pollin et al, 2008, p.6).

Strategies for Green Economic Investment	Representative Jobs
Wind Power	Environmental Engineers, Iron and Steel Workers, Millwrights, Sheet Metal Workers, Machinists, Electrical Equipment Assemblers, Construction Equipment Operators, Industrial Truck Drivers, Industrial Production Managers, First-Line Production Supervisors)
Solar Power	Electrical Engineers, Electricians, Industrial Machinery Mechanics, Welders, Metal Fabricators, Electrical Equipment Assemblers, Construction Equipment Operators, Installation Helpers, Laborers, Construction Managers
Advanced Biofuels	Chemical Engineers, Chemists, Chemical Equipment Operators, Chemical Technicians, Mixing and Blending Machine Operators, Agricultural Workers, Industrial Truck Drivers, Farm Product Purchasers, Agricultural and Forestry Supervisors, Agricultural Inspectors

From the analysis of various studies, green economic activities, in which green jobs perform their abilities, can range from renewable energy, alternative fuels, energy efficiency, sustainable agriculture than education, regulation, public awareness, and training (WIC, 2009). Many studies focus on energy and transportation because they have a critical role in tackling climate change and environmental problems. Thus, many governments demand to prioritize the sectors while meeting the aspiration on the creation of new job areas. Moreover, all sectors such as agriculture, manufacturing, and construction need a green transformation when considering the whole environment. Strategies can be powerful if they are reliable and applicable in the context of a national profile. The challenges at this point are that, there are no clear contents to decide which jobs might be considered as green. The efforts in the literature indicate that, investigating sectors and tasks with green criteria is a way to start. Right steps for detecting the content for green economic activity provides green employment with respect to national dynamics. After collecting a preliminary finding, the outline of strategies can be more robust and concrete (Renner et al, 2008).

3.2 Categories and Key Sectors of Green Jobs

To understand which green sectors offer the greatest potential for green jobs is important for drawing a green path for countries. Green economy influences the expansion of existing industries and creation of new employment areas (ECO Canada, 2012). Greater investment and interest in clean energy and sustainable practices leads green jobs to grow. As greening the economy is desirable and advancing technology gains important role, traditional industries such as construction and manufacturing start to implement a green vision. Systemically, classification of sectors that are emerging and holding high potential to become greener is essential for enhancing labor market strategies (Scarpa, 2009). Moreover, assessment of green impacts on sectors gives the change to attract many actors in the economy such as small-medium size enterprises, for-profit and non-profit business, social enterprises, public sector entities (Pinderhughes, 2007). According to the reviewed studies, green employment expanses through various sectors. Some of the studies prefer to divide sectors specifically with respect to the context of the country's economy, while some of them prefer to categorize sectors mainly in the dominant sector.

WWF (2009) released a report about low carbon jobs in Europe that was produced through assessing green jobs and the potential they have. The scope of the study was to provide numbers, estimations, and projections. For this purpose, they focused on three core areas: renewable energy sector, transport, and energy efficiency that are also shown in Table 3.5.

Table 3.5 : Core areas for green jobs defined by WWF (WWF, 2009).

Renewable Energies	Transport	Energy efficiency
Wind Power Solar Photo-Voltaic (PV)	Fuel Efficient Automobiles Hybrid–Electric Vehicles (HEVs) and Plug-in Hybrid Electric Vehicles (PHEVs)	Buildings Lighting
Concentrating Solar Power (CSP)	Urban Public Transport	Combined Heat and Power (CHP)
Solar Thermal Heat Energy	Car Sharing	
Bioenergy	Bicycles Rail	

For assessing the employment effects on the transition towards a green economy, UNEP and collaborationists evaluated sectors in six categories as in Table 3.6 (Renner et al, 2008).

Table 3.6 : Employment sectors for the transition to a green economy (Renner et al, 2008).

Sector	Including (but not limited)
Energy Supply Alternatives	Wind Power, Solar Photovoltaics, Solar Thermal, Biofuels,
Buildings	Energy Efficiency, Green Buildings, Retrofitting, Energy-Efficient Building Components
Transportation	Aviation, Road Transport, Transportation and the Wider Economy, Urban Mobility, Public Transport, Rail, Implications of a Modal Shift.
Basic Industry	Iron and Steel, Aluminum, Cement. Pulp and Paper, Recycling
Food and Agriculture	Global-Industrial Agriculture, Food System, Agro-Industrial Model
Forestry	Agroforestry, sustainable forest management(SFM)

Green Jobs Study Group which works under the umbrella of Workforce Information Council, proposed green economy activity categories with aggregating related sectors in six heads demonstrated in Table 3.7 (WIC, 2009).

Table 3.7 : WIC green economy activity categories (WIC, 2009, p.17).

Green Economic Activity	Activities Included (but not limited to)
Renewable Energy and Alternative Fuels	Manufacturing, production, construction, design, research, delivery, operation, storage and maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, ocean, methane, and waste incineration as a fuel source.
Energy Efficiency and Conservation	Manufacturing, construction, installation, production of energy efficient products (such as Energy Star rated appliances, more efficient lighting), energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements (smart grid), transportation technology, and battery development and storage improvement.
Pollution, Waste, and GHG Management, Prevention, and Reduction	Activities related to controlling commercial, transportation, and industrial emissions and pollution; water treatment, recycling operations, waste product management, and treatment. Includes controlling and reducing emissions of CO2, other greenhouse gases, wastewater, and other pollutants.

Table 3.7 (continued) : WIC green economy activity categories (WIC, 2009, p.17)

Green Economic Activity	Activities Included (but not limited to)
Environmental Cleanup and Remediation and Waste Clean-up and Mitigation	Environmental remediation including the cleanup and disposal of pollution, waste, and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.
Sustainable Agriculture and Natural Resource Conservation	Products and services to conserve, maintain, and improve natural resources and environment, including low carbon agriculture, land management, water management and conservation, wetlands restoration, and environmental conservation. Includes Bioscience related activities.
Education, Regulation, Compliance, Public Awareness and Training, and Energy Trading	Activities to educate the public, business, and government on energy efficiency, renewable energy, energy rating systems certifications (Energy Star, LEEDS), and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy-related products and processes. In theory, energy trading could include buying and selling of power or fuels related to energy efficiency and renewable energy as well as cap and trade activity to control pollution.

To clarify up-to-date situation in cities regarding the green economy, a study collated experiences of 90 cities through a global survey conducted by LSE Cities, ICLEI, and GGGI. The study focused on the strengths and weakness of cities in terms of green transformation, as well as opportunities and barriers. Regarding the integration of policies, the study defined key sectors for a green economy in six categories. These categories, which are land use, transport, buildings, energy, waste, and water, were examined with a comparative approach (LSE, 2013).

Stoyana and Harizanova (2015) conducted a study on Bulgaria with the purpose of assessing green job development after the transition take place. The study identified green job sectors and related economic activities linked to the production of goods and services for supporting the green vision. Sectors are presented in seven categories: manufacturing, electricity, water supply-sewerage-waste management, construction, transportation, administration, entertainment.

Another study done by Scarpa (2009) categorized the growing green economy and green jobs in eight sectors: energy efficiency, smart grid/smart energy, renewable energy, biofuels, green building, alternative transportation, recycling & waste management and sustainable agriculture.

ECO Canada (2010) reviewed existing structures of the Canadian labor market within industries, sectors, products, and services that are related to the green economy. The study of Canada determined green industries and sectors and allocated them into eleven categories: renewable and green energy generation, energy efficiency and green building, resource conservation, alternative and sustainable transportation, environmental protection, green products manufacturing, green services, sustainability planning & urban design, carbon and climate change mitigation, green retail and eco-tourism.

Another study (Dierdorff et al, 2009) performed an extensive review of the literature and identified twelve sectors for potential employment areas for green workers. These areas are defined as follows in order: renewable energy generation, transportation, energy efficiency, green construction, energy trading, energy and carbon capture and storage, research- design and consulting services, environment protection, agriculture and forestry, manufacturing, recycling and waste reduction, governmental and regulatory- administration.

Another categorization modified by Climate Change Business Journal is the 12-category division as seen in Table 3.8, which took place in the report of the Green Jobs Guidebook (EDF, 2008). Each category was detailed and index of green jobs was constituted.

Table 3.8 : Green jobs guidebook's green sector categories (EDF, 2008, p.3).

Green Jobs Segments	Included within Industry Segment
Low carbon power &renewable power	Renewable/conventional equipment & power sales, project design & development
Carbon capture & storages (CCS)	Systems, equipment
Energy storage: Equipment & Systems	Equipment & systems (batteries, hydrogen, etc.)
Energy efficiency and demand response	Systems, equipment & appliances, audits &studies
Green buildings	Design & development, building materials
Transportation	Vehicles, fuels, & systems

Table 3.8 (continued) : Green jobs guidebook's green sector categories (EDF, 2008, p.3).

Green Jobs Segments	Included within Industry Segment
Carbon markets: Trading & Projects	Carbon trading, project development & operation
Climate change adaptation	Risk assessment, planning, engineering, & construction
Public-sector /government	Conservation &pollution prevention, rules & enforcement
Consulting & Research	Consulting& engineering, climate science
Waste reduction & management	Recycling & waste treatment
Non-profit sector	Policy analysis & advocacy

Pinderhughas (2007) provided 22 sectors, which supply green collar jobs for the US economy. The study mainly aimed to enhance the Bay Area's green collar job sectors that are expected to grow. Due to the expansion in the green sector, opportunities of the green-collar labor force in areas such as alternative energy, bicycle transit, energy and water efficiency, green building, organic food, public transit, and recycling was investigated. This study realized that, there is a need for qualified green collar workers depending on their surveys that were conducted with the businesses in the area. These sectors include (Pinderhughas, 2007, p.3):

1. Bicycle repair and bike delivery services
2. Car and truck mechanic jobs, production jobs, and gas-station jobs related to bio-diesel, vegetable oil, and other alternative fuels
3. Energy retrofits to increase energy efficiency and conservation
4. Food production using organic and/or sustainably grown agricultural products
5. Furniture making from environmentally certified and recycled wood
6. Green building
7. Green waste composting on a large scale
8. Hauling and reuse of construction and demolition materials and debris (C&D)
9. Hazardous materials clean up
10. Green (sustainable) landscaping

11. Manufacturing jobs related to large-scale production of a wide range of appropriate technologies (i.e. solar panels, bike cargo systems, green waste bins, etc.)
12. Materials reuse/producing products made from recycled, non-toxic materials
13. Non-toxic household cleaning in residential and commercial buildings
14. Parks and open space maintenance and expansion
15. Printing with non-toxic inks and dyes and recycled papers
16. Public transit jobs
17. Recycling
18. Solar installation and maintenance
19. Tree cutting and pruning
20. Peri-urban and urban agriculture
21. Water retrofits to increase water efficiency and conservation
22. Whole home performance (i.e: HVAC, attic insulation, weatherization, etc.)

ILO also published a guidance note for strengthening the UN joint program with the purpose of guiding UN countries to make them integrate green jobs within a strategic context. Sectorial strategies compiled under the eight categories can be prioritized for green job development according to the context of the countries. These categories aligned as follows (ILO, 2011a):

1. Energy
2. Agriculture
3. Water
4. Fisheries
5. Forestry
6. Waste Management
7. Tourism
8. Construction and buildings

Beside spreading know-how for everyone, ILO has assisted over 30 countries in terms of green jobs assessment. The studies under the topic of green jobs are trying to facilitate countries in terms of exposed difficulties during the transition process to a green economy. They develop and present policymakers a guide for developing effective policies. Within the scope of the work, ILO applies decent work criteria while assessing the existing and potential number of green jobs in the country profile, if the data is available. Indeed, ILO highlights investment needs for green sectors and supports the creation of decent work and green jobs (URL-10). In these studies, green jobs assessments applied key sectors according to the country profile that can be seen below in Table 3.9.

Table 3.9 : Comparing sectors examined under the ILO green job assessment reports (Produced by the author).

ILO Reports	Malaysia (ILO, 2014)	Philippines (ILO, 2014b)	Mauritus (ILO, 2014a)	Lebonan (ILO, 2011)	Mongolia (ILO, 2010)
Agriculture	x	x	x	x	x
Forestry	x	x	x	x	x
Fisheries	x	x	x		
Energy	x	x	x	x	x
Water &Waste water	x	x	x	x	x
Solid waste	x	x			x
Transport	x	x			x
Construction	x	x		x	x
Manufacturing		x	x		
Tourism		x	x		
Government			x		

In the comparison of country assessment reports, it is seen that energy and water-waste sectors are dominant sectors for green employment studies. Agriculture and forestry are generally assessed together, therefore they can take place as secondly dominant sectors. In addition, the construction sector follows these as an important sector for green jobs studies. Lastly, transport and manufacturing sectors take an important role as one of the main sectors in green labor force studies.

It is important to keep in mind which sectors should be examined in practices. In addition to this point, Renner and friends revealed the greening potentials of sectors and some facilities by comparing the short and long-term progress, as seen in Table

3.10 (Renner et al, 2008). The table gives an idea to ensure which sectors are dominant and suitable for the future strategy development.

Table 3.10 : Green job progress by sectors (Renner et al, 2008, p.301).

		Greening Potentıal	Green Job Progress To-Date	The long-term Green Job Potentıal
Energy	Renewables	Excellent	Good	Excellent
	CSS	Fair	None	Unknown
Industry	Steel	Good	Fair	Fair
	Aluminum	Good	Fair	Fair
	Cement	Fair	Fair	Fair
	Pulp and Paper	Good	Fair	Good
	Recycling	Excellent	Good	Excellent
Transportation	Fuel-Efficient Cars	Fair to Good	Limited	Good
	Mass Transit	Excellent	Limited	Excellent
	Rail	Excellent	Negative	Excellent
	Aviation	Limited	Limited	Limited
Buildings	Green Buildings	Excellent	Limited	Excellent
	Retrofitting	Excellent	Limited	Excellent
	Lighting	Excellent	Good	Excellent
	Efficient Equipment and Appliances	Excellent	Fair	Excellent
Agriculture	Small-Scale Sustainable Farming	Excellent	Negative	Excellent
	Organic Farming	Excellent	Limited	Good to Excellent
	Environmental Services	Good	Limited	Unknown
Forestry	Reforestation/ Afforestation	Good	Limited	Good
	Agroforestry	Good to Excellent	Limited	Good to Excellent
	Sustainable Forestry Management	Excellent	Good	Excellent

It is beneficial to know which sectors have long-term potential for policymakers in terms of promoting green job opportunities. It is obvious that the renewable energy facilities draw an upward path today and in the future. In industry sectors, recycling activities have a positive potential for the enhancement of employment profiles. Approximately all transportation activities have incremental effects on greening. The building sector includes an outstanding performance for greening. Although agriculture has great potential, the progress of agriculture is inadequate. Organic farming and small-scale sustainable farming present potential if countries are able to expand a long-term policy. Furthermore, forestry activities provide green potential in the long run, despite the limited progress of the sector thus far.

Sectorial initiatives have an important role in the national economy in terms of the shift to a greener economy. Strategies are mainly constituted by specific sectors that steer structural transformation. Parallel to the development progress, investment strategies support the sectoral development (ILO, 2017).

After all these investigations that helps to capture more detail about green jobs dynamics and potentials, energy, building, and transport sectors are selected as the core sectors for green jobs creation.

3.2.1 Energy

The energy sector has an important role in the transition to towards green economy, due to the fact that it is responsible for a large portion of greenhouse gas emissions. Greening the energy activities is the best option to achieve climate goals (UNEP, 2012a). The goal of greening the energy sector can be achieved in two ways. One of these is to ensure efficient use of energy, the other one is to replace fossil fuels with renewable energy sources such as wind, solar and the like (ILO, 2012c).

Recently, renewable energy usage is increasing fast, and the growth is expected to continue for the upcoming years. The rising capacity can be seen in both wind and solar energy activities across the world (ILO, 2017). Although the level of awareness about renewables has increased, the overall picture shows that the share of renewable energy in total energy consumption is increasing modestly, as illustrated in Figure 3.2 (REN21, 2017).

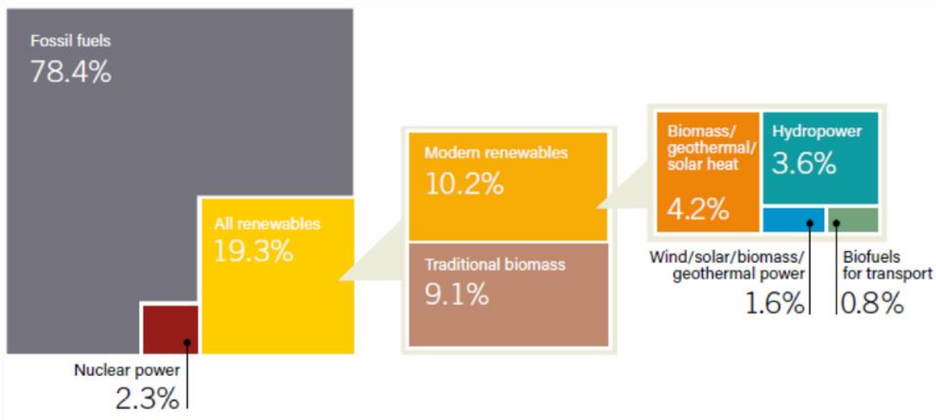


Figure 3.2 : Estimated renewable energy share of total final energy consumption 2015 (REN21, 2017, p.30).

The level of awareness about the renewables have led to an expansion in renewable production capacity. In 2016, the estimations show that almost 62 percentage of net addition to power generation accounted globally in renewable energies. Totally, by the end of 2016, it is estimated that, 24.5 percent of global energy is supplied by renewables, as illustrated in Figure 3.3 (REN21, 2017). Considering the progress of renewable energy development, the total share should be increased, due to the fact that renewables have the potential to provide enough energy to fulfill the global demand.

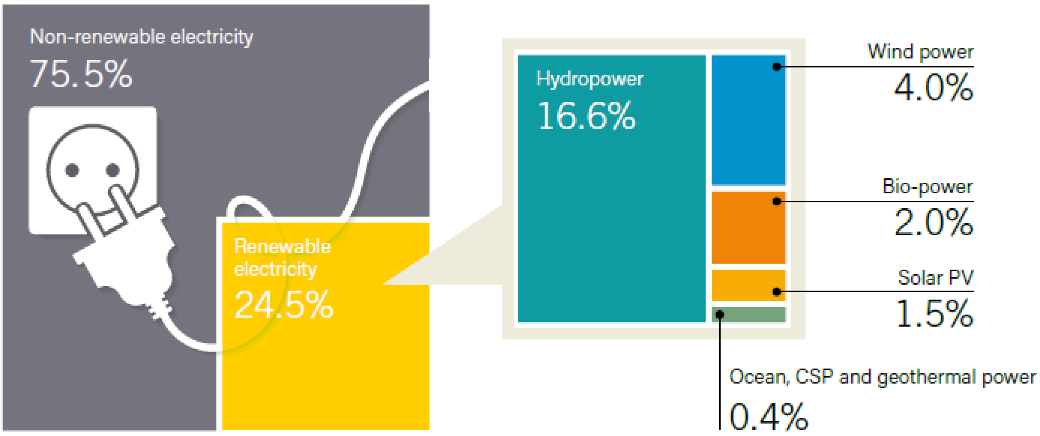


Figure 3.3 : Estimated renewable energy share of global electricity production in 2016, (REN21, 2017, p.33).

At national level, China comes to the forefront as being the largest developer of renewable power for the last eight years. It is obvious that developing countries have a better chance to increase their renewable capacities and adopt an energy transformation in industries compared to developed countries. By the end of 2016, top countries were China, the United States, Germany, Japan, India, and Italy in terms of renewable energy capacity (REN21, 2017). As it can also be seen in Figure 3.4 that, China's ambitious focus on rising it renewable capacity, especially in wind and solar power, can also attract interest from many other sources

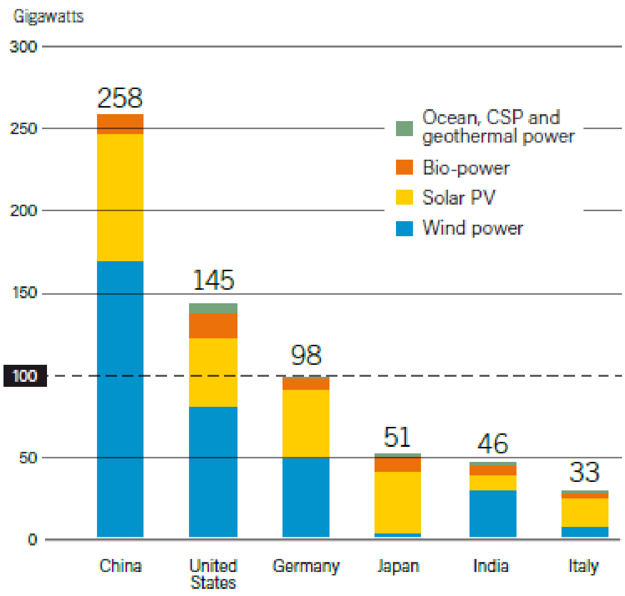


Figure 3.4 : Renewable power capacities in the world, top 6 countries, 2016 (REN21, 2017, p.33).

In order to reach the goals on renewables, achievements can be managed through different support mechanisms including substantial and sustained investments, feed-in tariffs, national and local politics. Globally, various economic stimulus packages and investments have increased for renewable energy and energy efficiency especially in developing countries after 2014, as seen below in Figure 3.5 (Frankfurt School-UNEP Centre/BNEF, 2018).

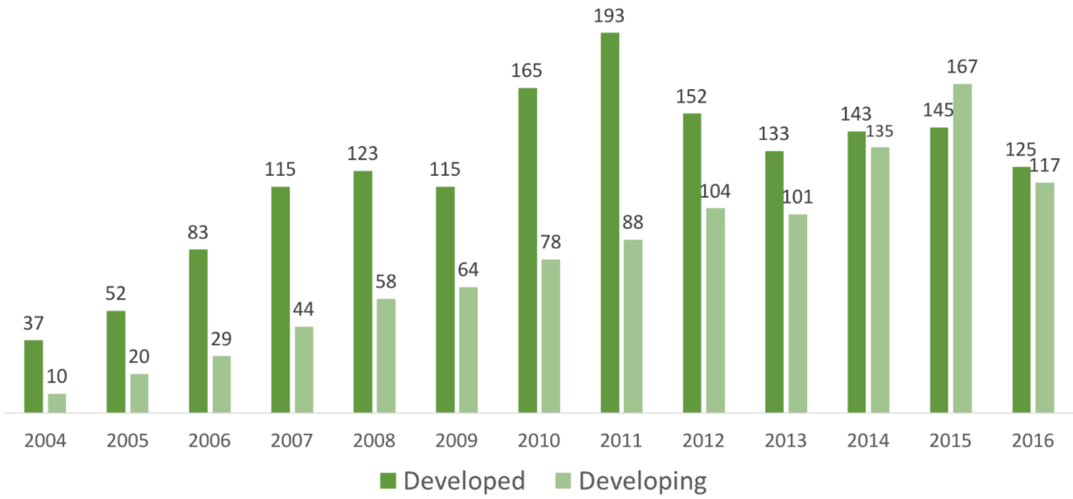
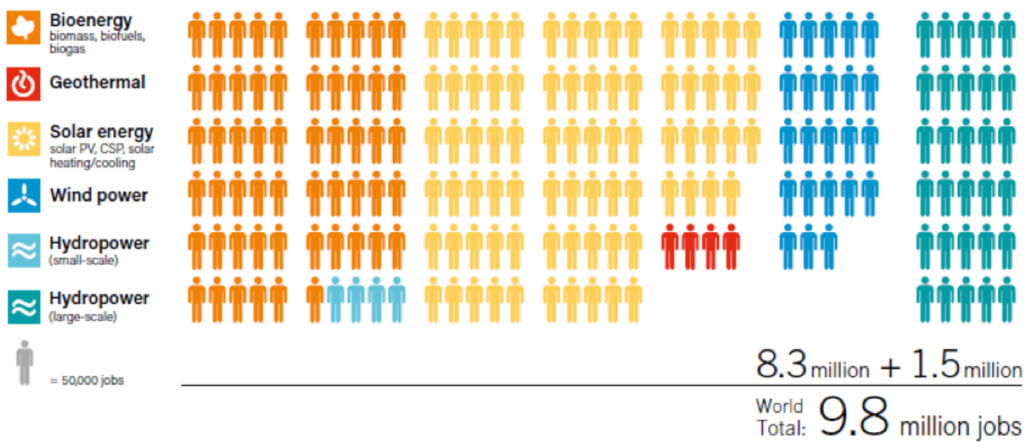


Figure 3.5 : Global investment in renewable energy (Frankfurt School-UNEP Centre/BNEF, 2018, p.15).

While the tendency to promote renewable energy is increasing, it is noticed that more labor force is required for production, adaptation of technologies as well as provision of maintenance systems (WIC, 2009). Thus, direct and indirect employment in the energy sector is growing rapidly. It is estimated that approximately 9.8 million jobs are allocated to the sector by the year 2016, as illustrated in Table 3.11 (REN21, 2017).

Table 3.11 : Global employment in renewable energy (REN21,2017, p.43).



Solar power also attracts attention, because of sharing an important ratio in overall employment numbers. At the national level, China has taken a step further and experienced a 19 percentages growth in solar PV employment. In addition, India and the United States have followed China. Almost 1.2 million people have been working in wind power facilities. In the wind sector, numbers indicate that Germany, United States, India, Turkey, the UK, and Brazil draw a great path in terms of job capacity.

The dominant market for jobs related to solar heating and cooling belongs to China although annual installations started to decline in the past few years. Other important employers are located in Brazil, Turkey, India, the United States, and Germany. Overall, renewable energy-related employment continued to shift towards Asia, which includes 62 percent of jobs. Especially China is a leader country in both technology and the number of employment (REN21, 2017).

Table 3.12 illustrates countries' green employment numbers including indirect and direct jobs in all energy sources.

Table 3.12 : Estimated direct and indirect jobs in renewable energy by country and technology (REN21,2017, p.43).

	World	China	Brazil	United States	India	Japan	Bangladesh	European Union		
								Germany	France	Rest of EU
Solar PV	3095	1962	4	241.9	121	302	140	31.6	16	67
Liquid biofuels	1724	51	783	283.7	35	3		22.8	22	48
Wind power	1155	509	32.4	102.5	60.5	5	0.33	142.9	22	165
Solar heating/ cooling	828	690	43.4	13	13.8	0.7		9.9	5.5	20
Hydropower (small-scale)	211	95	11.5	9.3	12		5	6.7	4	35
Geothermal energy	182			35		2		17.3	37.5	62
CSP	23	11		5.2				0.7		3
Hydropower (large-scale)	1519	312	183	28	236	18		6	9	46
TOTAL	9824	3955	1058	806	621	330	162	340	171	714

*Numbers are given in thousands

3.2.1.1 Solar energy

In basic terms, solar energy converts sunlight to produce electricity. Solar energy technologies can be an important source for any utility such as heat, light, hot water, electricity for homes, business and industry. In addition, solar energy can be absorbed through different technologies, for example, photovoltaic systems (PV), solar hot water, solar electricity, solar heating and cooling (BLS, 2011).

Especially from 2011, PV development has accelerated in solar technology. Globally, PV installations capacity has reached to 71 GW in 2015. Therefore, solar photovoltaic (PV) installation activities cover a large part of employers among the renewable energy sectors. IRENA stated that, there were 3.1 million jobs in solar energy by the year 2016. China has stepped forward with the position of being the largest installer and manufacturer of solar PV panels, so that it has been the largest market covering more than half of the jobs in the sector. Besides China, India and the United States have continued to boost the numbers of employment in solar energy. Also, Bangladesh has continued to support solar PV sector with growing employment numbers (IRENA, 2017).

The solar energy sector demonstrates a large potential for increasing the number of green jobs. European Photovoltaic Industry Association and Greenpeace projected future employment in solar PV with three scenarios. With the advanced scenario including high-level political support and substantial investments, it is estimated that over 6 million jobs could be created by 2030 (Renner et al, 2008a).

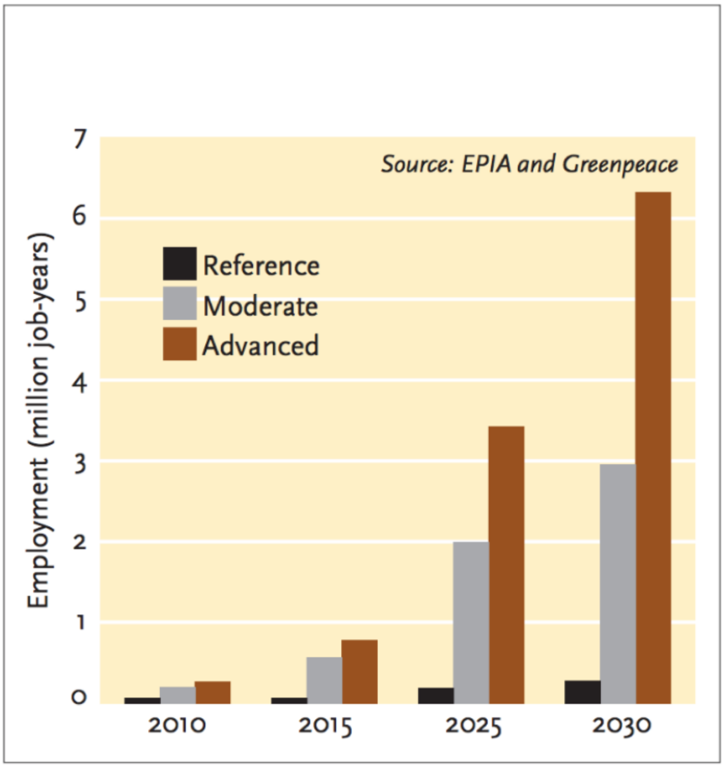


Figure 3.6 : Global solar PV employment projection (Renner et al, 2008a, p. 13).

Many countries that have not prioritized solar energy yet, will also increase the employment opportunities for the upcoming years. These countries are the ones that are classified in the developing countries category, including Brazil, India, Malaysia and South Korea. Many developments have been observed in developing countries as a best case to boost green jobs.

In Kenya, solar energy systems have been supported since 1980s and the country has created more than 200,000 solar systems including PV technology. These initiatives supplied many employment opportunities for young people in the slums of Nairobi and Kenya to gain a major role in the market. Another good example was seen in Bangladesh. A nonprofit company known as Grameen Shakti (GS) supplied more than 145,000 solar home systems for rural villages since 1996. The project empowered rural low-income people, and provide them access to green energy. The target group of GS was women and children. They participated in training and gained certificates for technical work, repair and maintenance of systems. The vision of the project was to implement 7.5 million solar home systems and create 100,000 green jobs, especially for young people and women. The solar systems were leading in the launch of new businesses including solar-charged mobile phone centers and electronic repair shops. Overall, this type of project helped to increase the use of green energy, prevented harm on the environment as well as increased the quality of life for citizens and provided jobs (Renner et al, 2008a).

3.2.1.2 Wind power

Wind power technologies are another rising alternative energy sector in many countries. In 2017, almost 55 GW of wind power capacity increase was calculated and the total number for wind power capacity reached nearly to 539 GW in the world, as seen in Figure 3.7 (WWEA, 2018).

Figure 3.7 : Total Installed Capacity 2013-2017 in the World (WWEA, 2018).

China again has been leading in the wind energy sector with new installations, while the new market area has also been expanding around the world. More than 90 countries have involved in commercial activities to meet their annual electricity demand from wind power (REN21, 2017).

Wind power has taken place in many national development strategies as a major driver to eliminate fossil fuel combustion and nuclear energy. Denmark recorded that, 43% of its power derived from wind energy in 2017. Following, Germany, Ireland, Portugal, and Sweden have also reached a significant amount of wind power share. Besides, the leader markets including the United States, Germany, India, United Kingdom and Brazil have had a strong growth (WWEA, 2018).

Table 3.13 demonstrates top 16 countries in terms of the development of wind power capacity from 2013 to 2017.

Table 3.13 : Top 16 countries with a capacity of wind power (MW) (WWEA, 2018).

Country/Region	Total capacity end 2017	Added capacity 2017	Total capacity end 2016	Total capacity end 2015	Total capacity end 2014	Total capacity end 2013
China*	187730	19000	168730	148000	114763	91413
United States	88927	6894	82033	73867	65754	61108
Germany	56164	6145	50019	45192	40468	34658
Rest of the World	48500	5600	42822	37522	32219	26493
India	32879	4600	28279	24759	22465	20150
Spain	23026	6	23020	22987	22987	22959
United Kingdom	17852	3340	14512	13614	12440	10531
France	13760	1695	12065	10293	9296	8254
Brazil	12763	1963	10800	8715	5962	3399
Canada	12239	341	11898	11205	9694	7698
Italy	9700	443	9257	8958	8663	8551
Turkey	6981	900	6081	4718	3763	2958
Sweden	6721	228	6493	6029	5425	4470
Poland	6534	752	5782	5100	3834	3390
Denmark	5320	93	5227	5064	4883	4772
Portugal	5316	0	5316	5050	4953	4724
Australia	4879	553	4326	4186	3806	3049
Grand Total	539291	52552	486661	435259	371374	318577

So far, wind power has employed approximately 1.2 million people worldwide. China, which is the leading country in terms of wind power installation, have covered nearly half of the global employment numbers in the wind energy sector. The United States has continued to expand the capacity and therefore the employment numbers. Germany has kept the leader role in Europe, employing 142,900 people (IRENA, 2017).

In 2010, The Global Wind Energy Council and Greenpeace predicted direct and indirect wind power jobs worldwide within three different scenarios, as shown in Figure 3.8. Under the advanced scenario, which is most optimistic, it was estimated that the worldwide employment will reach to 2.8 million by 2050. These numbers also include indirect jobs created in the supply chain (Renner et al, 2008a).

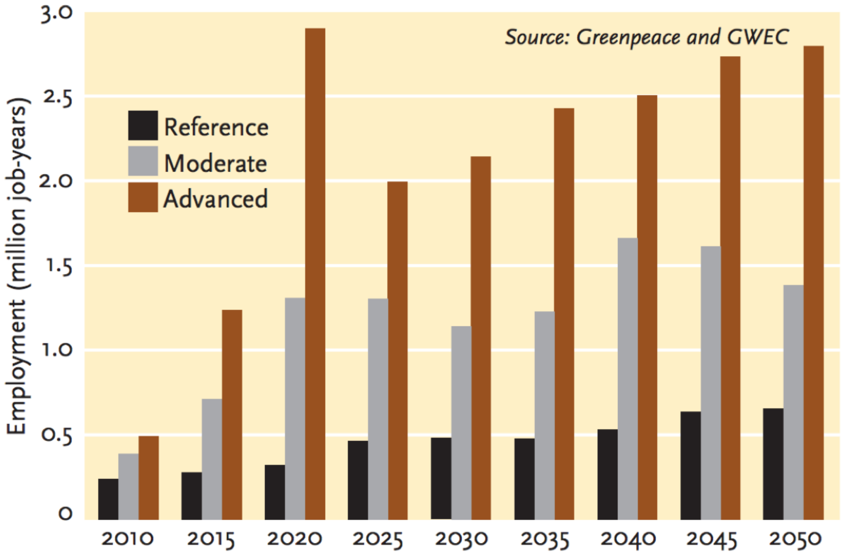


Figure 3.8 : Global wind power employment projection (Renner et al, 2008a, p. 12).

Wind power development can provide many employment opportunities especially in economically underdeveloped regions. However, creating jobs through wind manufacturing requires supporting mechanisms such as market strategies, public policies and national plans for development. The progress so far illustrates that, manufacturing and maintenance costs are declining. Many companies are willing to participate in the wind sector due to the fact that the earnings are rising. Thus, wind energy employment is expected to be more than estimated in 2010. Latest estimations declared by IRENA show that, 3 million jobs will be counted in the sector by 2030 and 4 million by 2050 (REN21, 2017).

Renewable energy sources such as wind, solar, hydropower, biofuels and geothermal are the major pillars of green job creation and development of a green economy. In this sense, it has a great importance to support the transition from a conventional energy sources to green energies through appropriate policies (Jacob et al, 2015).

Green jobs can be found in both energy production and consumption. Occupational profile in green jobs in the energy sector generally requires active labor market policies to improve the career paths. Training should be organized in accordance with the engagement of the components of manufacturing and construction. In the process of developing policies about green skills for renewables and employment opportunities should be decided through the participation of all the actors ranging from employee and policymakers (Jacob et al, 2015).

3.2.2 Construction

Buildings in general responsible for a large part of energy consumption and so carbon emissions. It is estimated that the building and construction sectors accounted for one-third of the total energy consumption. Therefore, the construction sector has a critical role to play in responding to climate change and achieving environmental targets. Becoming green and sustainable in the sector is estimated to provide approximately a 40% reduction in energy consumption and 35 percentage reduction in GHG emissions (OECD/IEA, 2013). In addition, the greening of the building and construction industries can have a positive impact on employment creation. At first, the structure and appearance of the buildings may not seem so different however, green buildings require specialized design, materials, and technology to minimize environmental impacts. Therefore, creating a green vision in the sector mainly demands skilled workers such as architects, construction managers and carpenters with the knowledge of new design techniques (Liming, 2011).

The growth of the sector is related to the population growth that the world is experiencing. It is declared that at least 9 billion people will live by 2050 especially in the urban areas. Therefore, the demand for buildings will always be on the agenda. At this point, greening the construction becomes an essential strategy, especially for developing countries (ILO, 2012c). In developing countries such as China and India, where urbanization trend is quite high and the expansion of middle-income class has a growing trend, it is expected that the building-related emissions and energy use will increase through new building constructions. Particularly, in China, approximately 300 million people are estimated to move to urban centers within the next two decades. Therefore, the new construction size will double the existing building stock by 2020 (Renner et al, 2008), which means that the construction sector has an important potential in terms of green vision.

Both the greening of the existing buildings through retrofitting and the greener construction of new builds have the potential to provide many green jobs. It is known that the building and construction sector employed more than 111 million people worldwide in 2001. According to Booz Allen and Hamilton (2009), in the US, the green building sector supported the creation of 2.4 million jobs and this number was expected to grow up to 7.9 million between 2009 and 2013. Another study showed that, the greening of the constructions increased the number of the total formal jobs from 6.3 percent to 7.3 percent in one year in Brazil. However, studies highlight the problem of data availability and the sector has been struggling because of the informal employment (UNEP, 2011).

The sector also influences economic activities indirectly by the use of green appliances and components. Adopting new green standards for washing machines, water heaters or fluorescent lamps have also led to the creation of additional jobs. For instance, U.S. Department of Energy predicted that, greening buildings can create 120,000 jobs in the related sector in the USA by 2020 (Renner et al, 2008). Also, in retrofitting activities related to building efficiency, it is estimated that every US$ 1 million investments will provide 10-14 direct and 3-4 indirect jobs (UNEP, 2011).

The stimulus packages of the governments accelerate the greening of the building sector. Germany is a country for many good examples for boosting energy efficiency retrofits. It is predicted that the stimulus packages are nearly equal 13 percent of the overall packages and around 105 billion US$ will create 25,000 jobs in retrofitting of the buildings. In line with the Government's Energy Concept 2050, the government collaborate with banks, trade unions, NGOs, and development fund programs for energy efficiency retrofits of residential buildings. Investments and numbers of retrofits generate employment but with a fluctuating trend over each year, as illustrated in Figure 3.9. Many retrofitting projects have been supported by bank loans or funding programs and created employment areas as well as reduced emissions (ILO, 2012c).

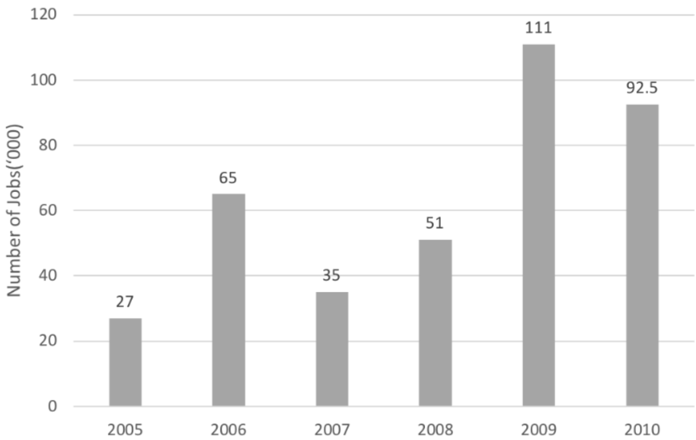


Figure 3.9 : The number of green jobs increased due to retrofit activities in Germany (ILO, 2012c).

According to the IPCC, retrofitting and replacing equipment contribute to a large proportion in the reduction of the emissions as well as in the increment of new job opportunities. Several studies prove the job creation potential of retrofitting activities in different countries. For instance, the European Trade Union Confederation reported that it would cost $4,300 billion to retrofit the EU's residential buildings, therefore to reduce carbon dioxide emissions by 75 percent. Implementing such policies would lead to the creation of 1.4 million jobs by 2030, and 2.6 million by 2050. Ecofys searched 10 member countries, that are Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia, and predicted that retrofitting the existing building stock can supply 50,000 to 185,000 jobs in 2005 (Renner et al, 2008).

Promoting new green construction resulted in the development of green standards that can be implemented by every country (or every firm) and can be followed easily. The U.S. Green Building Council (USGBC), which is a nonprofit organization, created and maintained the standards to rate buildings according to their level of sustainability. These standards fall under the building rating system known as Leadership in Energy and Environmental Design (LEED). Using these standards, buildings are rated in many different categories, including design, energy efficiency, and environmental effects. Although LEED is the most common green certification in the United States, there are other alternatives in certification systems (Liming, 2011). In the US, Canada, and India, LEED is a well-known green building certification system, whereas BREEAM (United Kingdom), Green Star (Australia and New Zealand) serve as the alternatives for different countries. There are many accredited professionals involved in the green buildings design, construction, operation and certification, and the numbers keep rising as the share of green buildings grows in time (Renner et al, 2008). In 2017, USGBC announced the top 10 countries, which are illustrated below in Table 3.14 (Stanley, 2018).

Table 3.14 : Top 10 countries and regions for LEED (Stanley, 2018).

Countries/Regions	Certified GSM (Gross Square Meters-million)	Number of Projects
China	47.16	1211
Canada	40.77	2970
India	20.28	752
Brazil	14.83	461
Germany	7.00	276
Republic of Korea	6.66	106
Taiwan	6.15	124
Turkey	6.06	245
Mexico	5.16	305
United Arab Emirates	4.41	207

The USGBC have released more than 158 million square meters of space and 6,657 LEED certified projects were accounted for this number. China is situated as a leader country with 47 million gross square meters (Stanley, 2018).

3.2.3 Transport

The transportation sector is responsible for 24 percent of global GHG emissions according to the 2010 statistics (IPCC, 2014). To eliminate this proportion of the transport sector, many cautions have been developed, ranging from little technical changes to broad system changes. For instance, fuel types that is directly related to the reduction of CO_2 emissions can be changed and this type of change helps reducing the vehicle-related air pollutants. Hybrid vehicles are also an option to supply efficiency as they contain electric engines and their production induce more employment than regular cars (Renner et al, 2008).

Besides to systematical and technical changes, greening the transportation sector can also be achieved by shifting from the private cars use to public transport. Sustainable and affordable transport systems ensure efficiency for economic development, as well as access to jobs and economic opportunity. However, many cities are suffering from car dependency and lack of integrated public transport systems. Luckily, the phase of car-oriented cities is slowly diminishing especially in developed countries and investments for transport infrastructures including light rail, bus lanes, stations, bike paths, traffic signals is expanding, so that their construction and maintenance creates jobs as well as increase the quality of life (UNEP, 2011).

In addition, there are alternative technologies to transform existing fleet in the transportation systems. For instance, new buses operated with compresses natural gas (CNG) offer a reduction in emissions. They are also widely used in China, Egypt, India, Iran, Japan, and South Korea. India introduced 6,100 new CNG buses with the creation of new 18,000 jobs (Renner et al, 2008). More than 80 countries are using CNG in their motor vehicle fleets. It is estimated that, there might be 50 million similar vehicles in circulation especially in the boundary of Pakistan, Iran, Argentina, Brazil, and India. Furthermore, in Pakistan, the employment rate is predicted to be greater than 30,000 people thanks to the CNG sector. In Bangladesh, the CNG sector employed about 10,000 people in 2009, who are mechanical engineers, technicians, supervisors, and such (ILO, 2012c).

Bicycles are the best alternative for an efficient mode of transportation. The top five countries in the production of bicycles are China, India, the European Union, Taiwan, and Japan. Data availability in global employment statistics is not very good in the related industry and businesses. However, the Institute for Transportation and Development Policy (ITDP) helps to enhance the bicycle market through modernization of the three-wheeled traditional bicycle type, known as becak in Indonesia. Meanwhile, Uganda and Kenya develop bicycle taxis and provide employment for large numbers of young people (Renner et al, 2008).

The gaps in data availability limit accurate estimations of green jobs in the transportation sector. There are also a few comprehensive estimations that can be seen below in Table 3.15 (ILO, 2012c).

Table 3.15 : Public transport employment estimation (ILO, 2012c, p.150).

Category	Employment (millions)
Public transport operators	7.3
By region:	
Asia-Pacific	2.8
Europe	1.4
Eurasia	1.2
Latin America	1.2
North America	0.4
The Middle East and North Africa	0.2
Sub-Saharan Africa	0.07
Public transport authorities	0.3
Supply chain	5.0
Total	12.6

Germany is one of the leading countries in the public transport labor force, with 237,000 direct jobs. Brazil also comes to the forefront by providing sustainable urban transportation jobs via the BRT system. According to World Bank studies, low carbon transport strategies may be a major driver in the creation of new jobs. Investments are on the agenda to support expansion of employment. It is known via World Bank studies that approximately US$34 billion investment in BRT lanes and subway systems can generate 3.1 million jobs (ILO, 2012c).

3.3 Measurement Methodologies of Green Jobs

There is a growing number of studies worldwide that aims to identify the economic effects of green jobs and green economy policies. In fact, measuring is the most important part of the all studies and it is also important in any steps taken in the strategic actions of countries. Measurements depend on the statistical facts. There are three reasons why the statistical data are important. First, statistical data is essential in order to grasp the real impact of the greening the economy and to apply green economy policies on the labor market. Second, the statistics help to decide which tools are effective to use in the transition towards the green economy. Lastly, they are important to track the progress through measurements (ILO, 2013c).

Most users including the general public, media, civil society, advisors, academics government officials and policy makers wonder about the size of the green economy in terms of the number of the establishments, the number of employees as well as their contribution to the value added, investments and exports so that to the economic growth. There are different kind of indicators that show the level of progress in the process of shifting towards green economy. Statistical numbers on green jobs respond to the concerns of various users. Moreover, employment measurements provide acknowledgment or tips for further steps for industries supported by subsidies, credits and they are useful when the actors have decided to seek support. Also, monitoring statistics help to expand economic structure in terms of production process, skills, education and training needs of the employees (ILO, 2013c).

Data collection is the most important and closely related part of enhancement of the statistical measurement on green jobs. Data collection activities should be conducted by national governance periodically. According to national priorities, political circumstances, or capacity problems data availability can be limited (ILO, 2013c).

This section details the approaches that are generally applied in the studies related to green economy and employment.

3.3.1 ILO’s approach

The Green Jobs Initiative was launched with the purpose of assessing, analyzing and promoting environmentally sustainable jobs with respect to climate change policies. This initiative was established with the collaboration of different organizations including the United Nations Environment Programme (UNEP), the International Labour Organization (ILO), the International Organisation of Employers (IOE) and the International Trade Union Confederation (ITUC). They support the development of green job terminology. They concentrate on examining different examples of green job creation in various countries, especially in the developed ones. The methodology and approach can also be used in developing countries. However, it is obvious that the structure of developing and developed countries in terms of economic, environmental standards, working conditions, priorities are not the same (Andrew et al, 2011).

The ILO announced a global program on green jobs to encourage the transition to green economy while ensuring social development at the same time. The program has conducted many studies with over 30 countries providing expertise and tools. It concentrates on green job creation and related subjects such as skill development, green enterprises, and green works. The service includes capacity building, know-how transformation, policy production, pilot projects (URL-11).

To assess the relationship between environment and employment in a developing country context, ILO explained its own method step by step as follows (Andrew et al, 2011):

- Figure out and determine the factors of green job promotion
- Illustrate the size and the form of national economy, predict the level of environmental related employment
- Classify the key environment-related employment and the scale of degree e.g. indirect and induced
- Deduct how many those jobs are in compliance with decent work conditions from the available data
- Investigative actions and changes should be applied to transform environmental-related jobs, which do not meet decent work criteria in the green jobs sector

At the end of the study, the expected outcomes include (Andrew et al, 2011):

- Calculations of total environment-related employment quantitatively

- Demonstrating how much environment-related employment jobs in the core sectors identified.
- Illustrating the whole picture of the country in terms of environment-related employment, which meets decent work criteria defined by the ILO/ UNEP and indicate green jobs.
- Sizing the degree of green jobs including indirect and induced
- Developing a roadmap for the policymaking process by screening different scenarios and strategies including drawbacks and potentials.

Data availability is precisely the cornerstone of studies. For this method, generic information is used that is obtained from (Andrew et al, 2011, p.8):

- national statistical accounts,
- national labor force surveys,
- market studies and market data,
- public policies, strategies, and investments,
- studies related to environmental, employment and social issues, and
- national input-output (I-O) tables or social accounting matrices (SAMs).

The ILO knew the risks about the data availability in developing countries. According to the ILO, national labor force surveys are another important source to analyze direct environment-related jobs regarding decent work criteria, which is related to the social dimension of green jobs (Andrew et al, 2011).

Environment-related employment can be calculated through both qualitative and quantitative methods. Business surveys are applied through quantitative methods while IO models represent a qualitative approach (Andrew et al, 2011).

Decent work criteria are obtained with a published guideline called "Decent Work Indicator" by the ILO (ILO, 2013d). In the framework of the program, the subjects are encompassed to grasp the meaning of the decent work in ten broad areas, with detailed information as seen in Table 3.16:

Table 3.16 : Decent work subjects used in the ILO green job program method (Andrew et al, 2011, p.14).

Decent work indicators	Explanation
Employment opportunities:	All persons (women and men) who want work should be able to find work, and the decision to work should be voluntary, in accordance with the minimum age of access to employment
Unforced paid work:	Work should be freely chosen and not forced on individuals. Certain forms of work are completely unacceptable (e.g. bonded labor, slave labor, and child labor). Workers should have the freedom to join workers' organizations.
Adequate earnings and productive work	Workers must have acceptable livelihoods including remuneration for all work carried out. Remuneration – especially in the case of wage workers – should correspond to a fair and living wage. Equal pay should be ensured for work of equal value.
Fair and equal treatment in employment	Fair and equitable treatment and opportunity at work and in access to work (coinciding with the absence of discrimination or harassment on grounds of sex, national origin, race, and age) should be ensured.
Decent working hours	Working time arrangements concerning daily and weekly working hours, regular and overtime work, and breaks and rest periods should reflect fair and acceptable practices and be compatible with social and family life. Work intensity leading to excessive hours threatens the physical and mental health and interferes with the balance between work and family
A fair balance of work and family life	Workers with family responsibilities (those with young children or elderly and sick family to care for) should be able to exercise their right to engage in work if they wish to, without being subject to discrimination. Family responsibilities fall most heavily on women.
Safe work environment	The physical work environment should avoid extreme conditions (heat, dust, noise, workload, etc.) and ensure a safe working environment with appropriate prevention of work-related accidents, injuries and occupational diseases.
Stability and security of work	This recognizes workers' needs to limit insecurity associated with the possible loss of work and livelihood
Social protection	Work conditions should be conducive to safeguarding health, pensions, and livelihoods, and should provide adequate financial and other protection in the event of work-related injuries or health-related contingencies.
Social dialogue and workplace relations	Workers should be treated with respect at work and should be able to voice concerns and participate in decision-making about working conditions. Workers' freedom to organize and collectively represent their interests is an essential ingredient of ensuring dignity.

Decent work indicators for analyzing the social dimension of green jobs mainly depend on time and data availability. Indicators are structured through examples illustrated in Table 3.17, which is derived from the example of Bangladesh studied by the ILO Asia and the Pacific (Andrew et al, 2011).

Table 3.17 : Decent work indicators (Andrew et al, 2011, p. 71).

Indicator	Examples
Rights at work	Child labor, Economically active children aged 10–14, Child school non-enrolment rate 5–14 years (from UNESCO), Women in the workplace, Female share of employment by 1-digit ISCO, Female share of employment by 1-digit ISIC, Gap between female and male labor force participation rates, Complaints/cases brought to labor courts or ILO
Employment	The labor force participation rate, the Employment-to-population ratio, The working poor, Wages, Number and wages of casual/daily workers, Manufacturing wage indices, Unemployment, Total unemployment rate, Unemployment by level of education, Youth unemployment, Youth inactivity
	Youth inactivity rate, Youth not in education and not in employment, Time-related underemployment, Employment by the status of employment and branch of economic activity, Labor productivity, Real per capita earnings (from national accounts)
Social protection	Informality and social protection, Informal employment, Social security coverage (for wages and salary earners), Rates of occupational injuries (fatal/non-fatal), Hours of work
	Usual hours of work (in standardized hour bands), Annual hours worked per person
Social dialogue	Trade union membership rate, Number of enterprises belonging to employer organizations, Collective bargaining coverage rate, Strikes, and lockouts: Rates of days not worked

After all, ILO follows the guide step by step in order to assess the green jobs, which is detailed through five tasks as illustrated in Table 3.18 (Andrew et al, 2011).

Table 3.18 : Five tasks of the ILO green jobs methods (Andrew et al, 2011, p. 39).

Tasks	Questions	Description
Task 1	What is the overall structure of the domestic economy and total employment?	Review the overall structure of the economy and employment
Task 2	What is the scale of environment-related economic activity and employment in the economy?	Estimate environment-related employment - Identify economic sectors and activities that have strong links to the environment - Research and write up sector profiles

Table 3.18 (continued) : Five tasks of the ILO green jobs methods (Andrew et al, 2011, p. 39).

Tasks	Questions	Description
Task 3	How big is core environment-related employment and green employment?	Estimate core environment-related jobs and green jobs - Estimate core environment-related employment by reference to agreed environmental standards and performance indicators - Screen core environment-related jobs to estimate green jobs
Task 4	How many other jobs do those cores and green activities support?	Estimate direct, indirect and induced employment - Assemble direct core environment-related job and/or green job estimates from Task 3 - Incorporate new industries in the I-O tables or SAMs - Calculate multiplier effects
Task 5	What is the impact of modeled interventions who wins and loses?	Identify "what if" scenarios

Tasks are highlighted with questions in order to define their boundaries in the following steps, as shown in Figure 3.10. Task 2 and 3 advise a framework for analyzing green employment, while task 4 requires a more professional approach and sheds light on the quantitative techniques with the available data. Steps can be influenced and changed according to the cases and countries' profiles, when there is data limitation and lack of information. In the final task, different policy scenarios or interventions can be tested to examine sectors and jobs (Andrew et al, 2011).

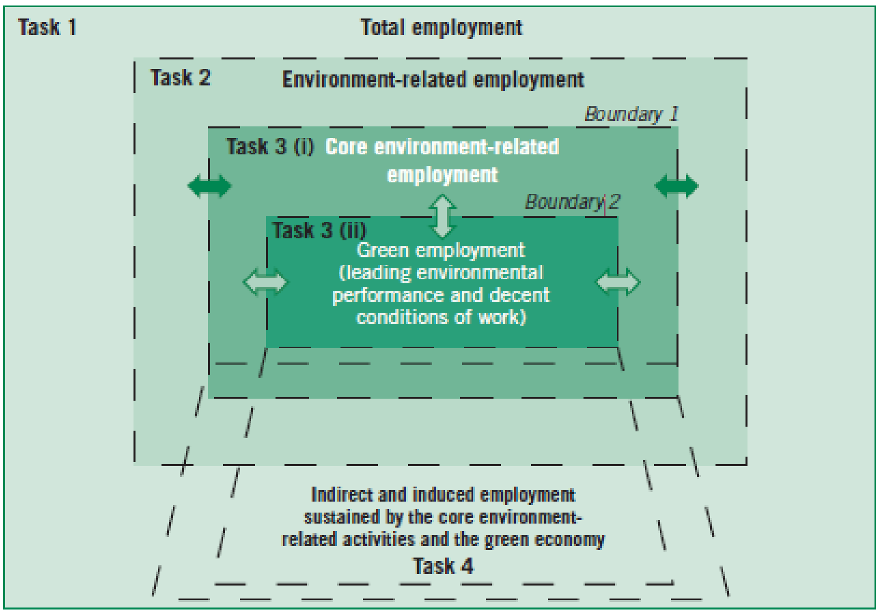


Figure 3.10 : The structure of five tasks (Andrew et al, 2011, p. 38).

The ILO's guide has been applied to different countries for calculating and estimating green employment affected by environmental activities in various sectors. Environment-related economic activities were analyzed, while core environment-related activities, which provide direct employment, were evaluated through interviews with experts or qualitative company surveys. Indirect and induced employment was estimated by input-output tables with respect to the available data. Lastly, investment scenarios were carried out in selected sectors (Andrew et al, 2011). Below in Table 3.19, there are the examples from further studies carried out by ILO. It can be seen that the content of tasks can be changed from the country to country, accordingly (Jacob et al, 2015).

Table 3.19 : The examples of ILO's green jobs studies (Jacob et al, 2015, p.48).

	Bangladesh (GHK, 2010)	Mauritius (ILO, 2013b)	Lebanon (ILO, 2011b)	Gaza (ILO, 2012b)
Objective	• To calculate and qualitatively assess green jobs in the whole economy • Static comparison of investment scenarios	• Calculation of green jobs in the whole economy • Static comparison of investment scenarios	• Initial assessment of the potential of green jobs	• Initial assessment of green jobs Potential with focus on the construction sector
Approach	• ILO guides	• ILO guides with limitations on qualitative assessment	• Exploratory	• Exploratory
Results	• 7% of employment in green economic sectors • 2% green jobs according to ILO • Employment factor in sustainable agriculture and transport industry is lower than in the sectors in general	• 6.3% of employment in green economic sectors • Employment factors are higher in green sectors	• Additional jobs could be created through investment in the areas of photovoltaic and solar thermal energies, organic farming, energy-efficient construction, and recycling; Net employment effects would be generally positive	• There is potential for a sustainable construction industry to improve material, energy and water efficiency. • State regulation must be expanded to cover this. • A sustainable construction industry could create new jobs by increasing local added value • Training programs would be needed to fully exploit the employment potential.

3.3.2 Asia green jobs index

The Asia Business Council created a green jobs index for assessment of the green employment arena. The index is constituted with green employment needs through green job posting, the market potential of green industry segments, labor availability for green jobs, and green job policies. The index concludes the level of current condition between Asian countries such as China, India, Japan and it offers recommendations about green job creation (Asia Business Council, 2009).

The Asia region is seen as vulnerable due to the fact that there are many job losses occurred in the region, especially after the global financial crisis. On the other hand, it is believed that, if the government follows the right strategy and stimulus plans, then the losses may be recovered (Asia Business Council, 2009).

The population is a huge challenge in the Asia. It is estimated that, there will be approximately 1 billion additional workers to join into the labor force in the world. It is considered that, Asia will account for almost 300 million workers. Japan, Taiwan, Korea and Singapore have already faced some losses in the workforce and they are as regarded as poor countries in terms of labor force. On the other hand, India, Indonesia, Philippines and Malaysia can be described as labor rich countries. This situation causes some struggles in finding workers with the right skills for the new and technology-driven industries (Asia Business Council, 2009).

In the framework of green jobs, it is estimated that, they can generate 100 million jobs over the world. With a similar approach, the Asia region is also expected to account for 50 million green jobs. Green jobs can be created in the new sectors as well as in the existing sectors with the necessary upskill training. It is known that green jobs can boost the declining sectors. For instance, in Asia, manufacturing jobs were decreasing because of being not able to comply with the technological advances, even if there is a growing workforce. Through green jobs manufacturing, the sector can potentially revive again. The manufacturing industry can reverse the process with green products. Through this scenario, production capacity will be expanded, besides indirectly employment capacity will be increased (Asia Business Council, 2009).

The index compares 13 Asian economies according to four equally weighted aspects. Two of them focus on the understanding of green jobs labor situation for the present time and for the future. The other two are related to measure green jobs enablers.

Environmental programs offered by universities, the number of graduate students in science and engineering is considered as green labor availability in this respect. Indeed, international standards applied for revive the economy with green jobs are taken into consideration (Asia Business Council, 2009).

China is on the top in overall ranking in the world, and it is followed by Japan and India. China’s economy is one-step ahead in green labor demand thanks to its renewable potential. India is the second most important country, which has many green jobs activities so that many potentials. Japan is also good in terms of green labor availability thanks to its university programs on environment-related issues. There is a potential that all the countries in the rank have green job policies that can foster green job growth (Asia Business Council, 2009).

Figure 3.11 shows all ranking among the Asia countries including indicators considered in the evaluation process.

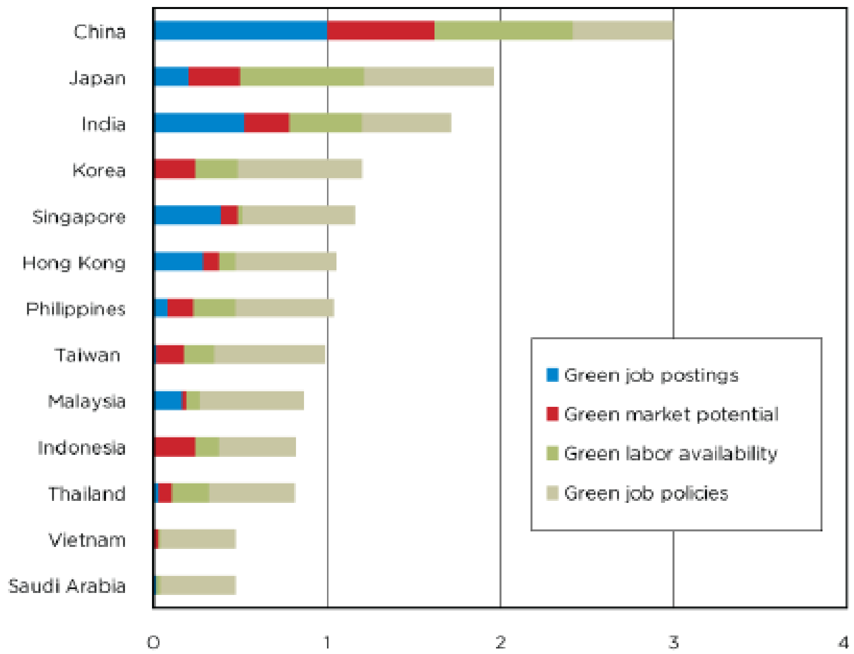


Figure 3.11 : Asia green jobs index result (Asia Business Council, 2009, p.6).

Renewable energy usage is accounted as an indicator in all industry segments for measuring the market potential. It can be said that China is the leader country in most of the indicators. China also supported solar energy, LEED-registered green buildings, and organic farming. Besides, India is another regional leader in electricity production via wind power, although is ranked as the third. Japan as well as Indonesia are known for biomass electricity generation. The Philippines is focused on geothermal energy generation. Korea's economy has turned towards waste activities. Korea announced its national waste management plan, including financial opportunities for new enterprises in recycling, packaging regulations. (Asia Business Council, 2009). Table 3.20 presents indicators, measurements and their weights in the process of green jobs index.

Table 3.20 : Indicators of Asia green jobs index (Asia Business Council, 2009, p.15-16).

Category	Indicator (each weighted equally within dimension)	Measure
Green job postings (25% weighting)	Current job postings in environmental areas	Average daily number of career site job postings
Green market potential by sub-sector (25% weighting)	Wind	Electricity production by wind (GWh)
	Solar	Electricity production by solar (GWh)
	Biomass	Electricity production by biomass (GWh)
	Geothermal	Electricity production by geothermal (GWh)
	Green buildings	Number of LEED registered Buildings
	Energy-efficient cars	Fuel economy standard for new passenger vehicles (MPG-converted to Cafe test cycle)—2010 estimate
	Waste management	% of waste recycled and composted (% of all municipal waste collected)
	Sustainable agriculture	Organic land area (hectares)
	Green finance	Expected average annual certified emissions reduction (CER) credits from registered projects by host party (average annual reductions)
	Eco-tourism	Protected natural areas: world heritage sites (thousands of hectares)
Green labor availability (25% weighting)	University training for green jobs	Number of top 500-ranked universities with environmental engineering/management/studies programs
	Science and engineering graduates	The annual number of university graduates in science and engineering
	Managers	Number of workers in managerial functions
Green job policies (25% weighting)	Current environmental policy development	The score in EPI Environmental Performance Index—scores for each of the five core policy categories– Air Quality, Water Resources, Biodiversity and Habitat, Productive Natural Resources, and Climate Change
	Specific green jobs policies (1 point if there is an existing program at the national level or if the program is mentioned in top government leader's policy)	Worker education and training/re-training for green jobs
		Green job creation
		Green enterprise and small business funding/investment incentives/tax credits
		Government procurement of green products and services
		Health and safety regulations for green jobs

The available supply of talent in the environment disciplines boosts competitiveness in green sectors. Japan have specialized in serving environment-related programs in its 29 universities. However, skillsets are still challenging. Besides, lack of data makes it more difficult (Asia Business Council, 2009).

It is acknowledged that, without the support from the governments on green economy with policy mechanisms, the green economy, which is innovative, inclusive and competitive, will never be achieved. Policies range from safety regulations for ensuring the jobs to be decent, tax credits and incentives for new private initiatives. Through the index, the most popular policy is the job creation and procurement of green products and services. Many governments in the index have a specific plan and target to increase the number of green jobs with low carbon projects in different sectors (Asia Business Council, 2009).

3.3.3 BLS's approach

Following the announcement made by BLS in September 2010, it was agreed that the final definitions for green jobs (A & B) can be utilized further to conduct many international studies and consultation to stakeholders and to the public (URL-12).

A. Environmental jobs where services and products are produced with environmental benefits in mind, coupled with the preservation of natural resources.
B. Environmental jobs where part of the designated role involves the reduction in the use of natural resources, where possible and the company`s production techniques adopt a more environmentally friendly approach.

To summarize, one of the aims of the BLS is to calculate jobs related with the production of environmentally friendly products. Examples include solar panels, environmentally friendly cosmetic products or the production of plastic using recycled materials (URL-12).

The objectives of the Bureau of Labor Statistics (BLS) are to delineate environment-related occupations and accumulate associated statistics. To achieve this, surveys were conducted to measure employment rates and salaries in green economic activities. The survey results were published with agreed definitions and methodologies identified for environmental activities (URL-12):

1. The output approach, which outlines companies involved in the production of green goods and services and numbers of associated jobs; and
2. The process approach, whereby companies use environmentally friendly manufacture processes/practices and the associated jobs are tallied.

In the output method, the aim of the BLS is to identify and evaluate jobs producing specific goods and services, which are not involved in the environmental production impacts. In isolation, the output approach would not include activities and jobs that have positive impacts on the environment, although the product or service is not environmentally friendly. The process approach is intended to address this. There are different measurement methods for each approach, and they tend to measure different job roles, although there are some commercial commonalities in green goods and services (URL-12).

3.3.4 O’NET’s approach

The Occupational Information Network (O*NET) is a technologically advanced network founded via sponsorship of the USA Department of Labor/Employment and Training Administration (USDOL/ETA), through a grant scheme from the North Carolina Department of Commerce. The department of commerce operates under the National Center for O*NET Development. The O*NET Program is the nation's primary foundation for employment statistics (URL-17).

The O*NET database captures hundreds of systematic and occupation-specific descriptors in almost 1,000 occupations throughout the US economy. This publically accessible, free database is a working document, which is continuously updated via various trained employees in each specific occupational fields (URL-17).

O*NET is a Standard Occupational Classification (SOC) system. Businesses, training platforms and educational institutions, labor and occupational organizations, and professional associations can all access and utilize the OCA process, and enable them to establish a job title or occupational specialty that falls within the specifications of the O*NET-SOC system and the USA labor market (URL- 17).

The USA Department of Labor defines green jobs via employee skill sets. Utilizing occupational knowledge, skills, and abilities data from O*NET, authors outline green careers as those likely to be affected by green economy activities. Green occupations are selected through the meta-analysis of green economic research and writings. (Peters et al, 2014).

Relative to the other reports, which place an emphasis on industry, the O*NET report, “Greening of the World of Work: Implications for O*NET-SOC and New and Emerging Occupations” adopts occupational methods. The O*NET report is useful from a workforce development viewpoint because O*NET assesses and evaluates the green economic impacts on occupational requirements, across twelve environmental sectors. Although similar definitions are used for the green economy throughout the industry, O*NET approaches the green economy in a fundamentally different way. The report adopts an occupational approach, and the focus of labor economists and workforce developers is on the greening of the economy (Dierdorff et al, 2009).

The report rejects the static green job concept and instead, it focuses on the dynamics of green economic effects on work and employee requirements. The greening of the occupations is defined as: “…the extent to which green economy activities and technologies increase the demand for existing occupations, shape the work and worker requirements needed for occupational performance, or generate unique work and worker requirements”. The O*NET framework is exclusive in accepting partially green occupations and accepts that technology is the main driver of the green economy. Currently, the report perceives that: “the extent green economy literature has not taken an occupational-level approach, focusing instead on broader industry-level outputs or products, such as renewable power generation and environmental protection enhancement”. However, as the green economy is still a developing industry and its direction is unknown, it is not yet fully realized what technologies will be required, further developed or created. Therefore, the authors believe that the focus should shift from green ‘jobs’ to green ‘occupations’ through time (Dierdorff et al, 2009).

Based on this, the report further identifies three generic categories that describe the effects of the green economy and green technologies on the occupational requirements (Dierdorff et al, 2009):

1. Green increased demand occupations, where the work context may change, but the tasks, knowledge, skills, and abilities do not,

2. Green enhanced skills occupations, where the occupation's purposes remain the same, but tasks, skills, knowledge, and external elements, such as credentials, have been altered,

3. Green new and emerging occupations, where the demand of the green economy and technologies have created the need for "unique work and worker requirements"

3.4 Policy Roadmaps of Green Jobs

The notion of green jobs does not have a universally agreed definition and there is no agreement that draws the line between traditional jobs and green jobs. Particularly, this situation pushed the nations to develop their own definitions and implications. Governmental policies are the most powerful tool to accelerate these studies (OECD, 2012).

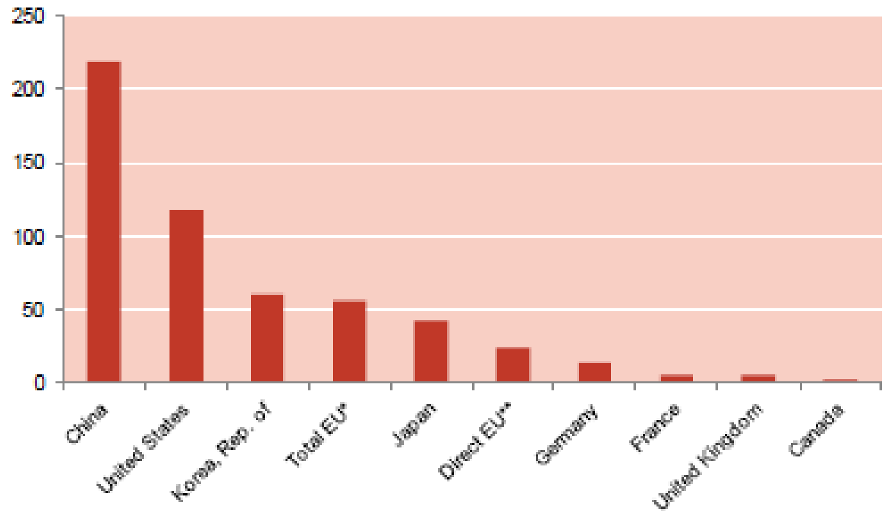
To date, the US and some rapidly developing countries like Brazil and China have documented their growth in green jobs in the industries within their countries. Green jobs also started to be recognized and recorded in other developing economies. As before mentioned, currently in Bangladesh, projects that involves training for local youth and women to certify them as solar technicians, and repair and maintenance specialists are about to start. The purpose of these projects is to create approximately 100,000 related jobs. Furthermore, an initiative in India has been developed to replace inefficient biomass cooking stoves with a more innovative version for 9 million homes, leading to the creation of 150,000 jobs. It is apparent that a green economy can generate employment and progressive skill sets in any region, offering proper and fulfilling careers (UNEP, 2008).

The OECD questionnaire on green jobs and policies covers 27 OECD countries. This questionnaire was issued to the ministries related to employment and labor in OECD member countries in November 2010. The perception level, current policies, and targets were received from the respondents with the OECD questionnaire. The responses were gathered to understand the situation in different countries (OECD, 2012), that shown below in Table 3.21.

Table 3.21 : Responses of 27 OECD countries to questionnaire conducted by OECD (OECD, 2012).

Countries	National definitions of green jobs	Quantifying green employment
Australia	Yes	Yes
Austria	Yes	Yes
Belgium	No	Yes
Canada	Work in progress	Yes
Chile	No	None
Czech Republic	Work in progress	Yes
Denmark	Work in progress	None
Finland	Yes	Yes
France	Yes	Yes
Germany	Yes	Yes
Greece	No	Yes
Hungary	Yes	Yes
Israel	No	None
Japan	Yes	Not available data
Korea	Yes	Yes
Mexico	No	None
Netherlands	No	None
Norway	No	Yes
Poland	No	None
Portugal	Yes	Yes
Slovak Republic	No	None
Slovenia	No	None
Spain	Yes	Yes
Sweden	No	None
Switzerland	No	Yes
Turkey	No	None
United States	Yes	Yes

The HSBC (2010) announced that, approximately around 521 billion US$ that corresponds to 16.3 percent of all financial measures was dedicated to the green stimulus by at the end of the year 2009. In Figure 3.12, it is obvious that China and the US are the main contributors. Over one-third of the massive Chinese stimulus package and nearly 27 percent of the 2009 budget have been allocated to green themes including rail grids and water infrastructure, that coupled with environmental improvement expenditure.



*: Includes direct EU contribution and member states; **: Direct EU contribution.

Figure 3.12 : Green stimulus by countries by the end of 2009 (USD billion) (HSBC, 2010).

According to the information above, it is decided to analyze the progress of the top countries on green jobs including China, United States, and Germany as the rising star of the EU.

3.4.1 The United States

The United States have accelerated clean energy policies, especially in the period of President Obama. The states have adopted clean energy and energy efficiency mechanisms in a various way including tax incentives and green stimulus. In the promotion of clean energy activities, job creation was used as an important influencing slogan. At the federal level, the American Recovery and Reinvestment Act (ARRA) was launched to design stimulus packages for clean energy in 2009 by the Obama Administration and the states has followed the policies to create green jobs (Rabe, 2004; Yi, 2013).

HSBC Global Research (2010) illustrated that mainly the renewable energy was preferred in green stimulus, as seen in Figure 3.13.

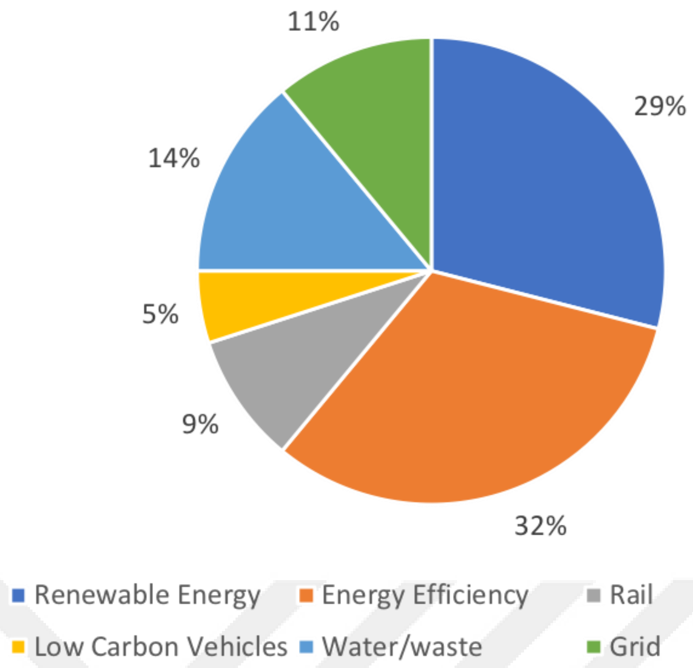


Figure 3.13 : United States' green stimulus spending per sector (HSBC, 2010).

The American Recovery and Reinvestment Act adopted in 2009 included funding for energy and green jobs training programs as well. These investments were ordered as (Office of the Vice President, 2009):

- More than $11 billion for investments in a new smart grid, investments that will create thousands of miles of new or modernized high-tech transmission lines, while training and employing highly-skilled and well-paid line workers.
- $500 million for research and job training projects that prepare workers for careers in energy efficiency and renewable energy.
- $6 billion for a loan guarantee program that will enable green industries to continue their rapid growth.
- $5 billion to the Weatherization Assistance Program that could save homeowners $350 per year on their utility bills.

By accelerating investments and ensuring that American workers have gained the skills needed to be successful in these high-quality green jobs, the ARRA takes the first critical steps to make America a fertile place for sustained green growth and job creation for the following years. Key provisions of the ARRA that will help create green jobs and pave the way for future green investments include (Office of the Vice President, 2009):

- Building thousands of miles of high-tech transmission lines
- Greening the federal government
- Investing in green retrofits
- Establishing a clean energy finance authority
- Launching a green job training program

3.4.2 China

Over the past few decades, and especially during the 11th Five-Year period of 2006–10, China has prioritized green development in almost all of its leading economic sectors. One of the greatest promises of China's green transition is the potential for expanded employment in its industries and economic sectors that can help slow and possibly reduce the country's environmental impact. During the 11th Five-Year Period (2006–10), China's solar PV power sector generated around 2,700 direct jobs and 6,500 indirect jobs annually. Besides, it is expected for these numbers to increase to an average number of 6,680 direct jobs and 16,370 indirect jobs annually in the years between 2011 and 2020 (Pan et al, 2009).

In addition, the Chinese market for alternatively fueled vehicles is expanding rapidly. By mid-2010, China was home to 5,000 vehicles, with a combined distance of over 81 million kilometers to travel. If the government continues to prioritize the development of hybrid and electric vehicles during the 2011–20 period, cumulative production could reach to an average of number of 1.67 million vehicles annually. This would lead to the creation of roughly 1.2 million green jobs annually in this sector, on average (Pan et al, 2009).

Already a world leader in high-speed rail (HSR) development, China aims to have 18,000 kilometers of HSR by 2020, which would create an average number of 230,000 direct and 400,000 indirect jobs annually during the 2011–20 period, with a total number of 630,000 jobs annually. As one of the most populated and rapidly growing cities in the world, Beijing's municipal government has speed up its urban rail ambitions in recent years. The current targets include completion of 660 kilometers of lines by 2015 (with a total investment of $77 billion) and construction of another 340 kilometers of lines during 2016–20 (with a total investment of $69 billion). This could bring more than 437,000 jobs each year by 2020 (Pan et al, 2009). From the 2009 data recorded by HSBC global research, China's green stimulus spending accelerated the rail system development, which can also be seen in Figure 3.14 (HSBC, 2009).

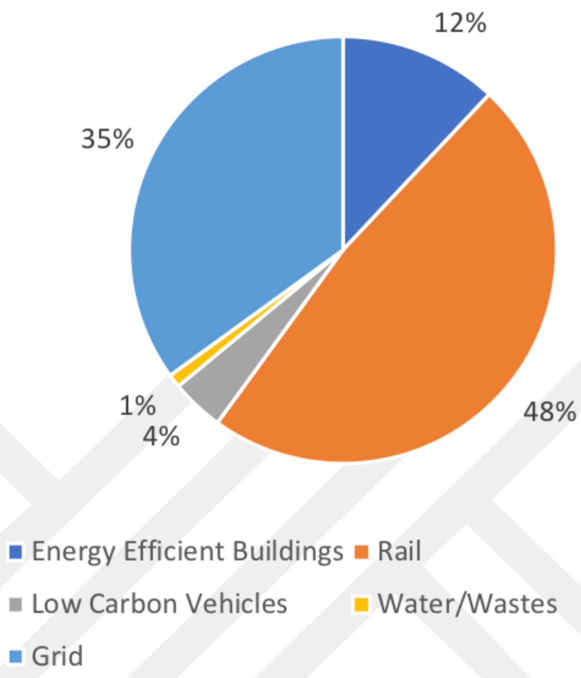


Figure 3.14 : China's green stimulus spending per sector (HSBC, 2010).

The forestation sector employed as many as 1.8 million full-time workers in 2010 alone, or an average number of 1.6 million workers annually during the 2005–10 period. To achieve the 2020 goals, China's forestation activities offer as many as 1.1 million direct and indirect jobs annually during the 2011–20 period. Managing the newly added forest area is expected to bring another 1 million jobs during this period. China also has a great potential to expand its niche sector on forest park tourism, as the country is home to more than 2,000 forest parks nationwide (Pan et al, 2011).

3.4.3 Germany

Germany has made a significant progress in the transition to green economy comparing the other countries among the EU. Germany has an important role in green technologies as well as in its workforce employed in the environmental sector. Germany has adopted the vision to have the most energy efficient and greenest economy supported by the ambitious targets in the reduction of energy consumption (Buhler et al, 2011).

Germany proposes to make a number of economic changes in line with its green goals and stimulus package. One component of this proposed shift includes the introduction of new legislation, like the Renewable Energy Sources Act, which was adopted in 2009. Germany's goal is to increase the share of renewable energies in the total electricity consumption to at least 30 percentby 2020, which is twice of the current share that is around 15 percent. Within Germany, 280,000 jobs were created in the renewable energy and investment plan sectors, with some of the investment that was financed via the stimulus package. As a result, 30,000 more roles are expected to be created in the construction and offshore wind industries (HSBC, 2010).

Germany has enjoyed a remarkable expansion of renewable energy in the last decade. The share of renewable energy in electricity generation rose from 6 percent in 2000 to 16 percent in 2009. Over this time, the German government revised its own targets twice, because the previous targets had been exceeded already before the scheduled time. The German government is expecting a share of 38 percent renewable power by 2020 and continues to drive the transformation towards an energy system based completely on renewable energies (Buhler et al, 2011).

The economic benefits of this development are impressive. By 2010, the renewable-energy-related jobs employed around 340,000 people, most of them in biomass, wind power, and solar. In comparison, the German lignite industry employs only 50,000 people—from mining to the power plant. The key policy document responsible for this success is the Renewable Energy Sources Act, first enacted in April 2000. The feed-in-tariff policy that is embedded in the climate and energy policy framework have promoted renewable energy and efficiency technologies, so that promoted green job creation. The Act also includes the laws to encourage combined-heat-and-power plants, a cap and trade system, the energy tax reform and several additional measures. The next planned revision on the Act aims to incentivize grid access and grid improvement, offshore wind power, and technologies for peak management and power storage (Buhler et al, 2011).

Climate protection and energy efficiency are the top priorities for the investment plans, and building infrastructure and vehicles are the main focus of the energy efficiency plans. It is estimated that 25,000 jobs can be created in the manufacturing and construction industries, by retrofitting the buildings with energy efficiency schemes. Based on actual expenditures versus budget projections, the most of the expenditure is likely to occur in 2010, with 20 percentage of the total spending projected for the year 2009, and this earning will be further used for road infrastructure improvement. The initiation of other, possibly “greener” transport investments in German railway systems (US$ 1.7 billion) or research on innovative propulsion (US$ 655 million) is a much more protracted initiative. Delays in the initiation process are partly because of the administrative process, which illustrates transparency and accountability of the expenditure (HSBC, 2010).

3.5 The Dark Side of Green Jobs

Despite the fact that new job areas are being created in the transition process to a greener economy, the issue of climate change can also negatively affect the labor force. This is mainly because the sectors that have a negative effect on the environment is expected to diminish. As mentioned before, UNEP and ILO identified the different effects of the greening the economy on the employment market in four categories: new jobs will be created, some jobs will be eliminated, some jobs will be substituted and some jobs will be transformed (Renner et al, 2008). From this point, some studies call for giving attention to total net job counts. They assert that, even if new jobs will be created, total job gains can stay under target because of the dissolution of some jobs.

Classifying new green jobs can also be challenging. For instance, a farmer can decide to supply biofuels industry with agriculture waste, however, does not switch the product. In this scenario, should the farmer be counted as a green worker, even though the crop is not a green product? In another point, should the farmer be counted as a part-time green worker? However, it is obvious that this kind of job cannot be specified as a new job. So, the problem is appeared in the existing labor transformations (Gülen, 2011). Another example for this scenario is that, train operators normally delivers products that are different from green products, but they also contribute to the delivery of wind turbine components for a specific project. Although the wind power activities are clearly counted as green jobs, there is a confusion in this example as the operator partly contributes in wind power activities. Therefore, the situation leads to a confusion about whether the train operators should be counted under green job category or not, as they are delivering two different kinds of product (Pollin et al, 2008).

Another argument is related to calculating the number of jobs. In a study of Global Insight (2008), engineering, legal, research and consulting sectors cover the majority of green jobs. The problem is that firms in engineering, legal, research and consulting sector assign a certain number of their human resources as green jobs. However, some studies take all the occupations into account, like in the firm Serve Green.

In addition, there is a controversy in the sectors defined as green. Some studies count nuclear industry, hydro, biomass as green alternatives. Some experts warn about the negative impacts of nuclear facilities. Besides, there are many debates about hydro facilities due to the damage they pose on the ecosystems in establishment processes, because of changing the flow paths of the rivers that they are established on. Additionally, because of the process of biomass produces high amount of emissions, occasionally the sector cannot be considered as environmental friendly (UNEP, 2011).

Some other concerns arise from unfortunate experiences, as in the case of Spain. The strategic programs of Spain supported renewable energy implications with the purpose of decreasing the energy dependence of the country and creating new employment areas. However, the result of the green programs couldn't be realized as expected and more jobs were destroyed rather than created. It is stated that, for every green job created, 2.2 jobs were demolished and every green megawatt installed, 5.28 job have been lost (Alvarez et al, 2009).

In the literature, there are some gaps related to this situation. The study of Gülen (2011) did not mention the degree of the job losses; rather it simply focused on the 'glory part' of the green development.

It is also claimed that, theory and regulations for arguments are insufficient. The nature of the green economy cannot be explained by a basic theory. It is also hard to interpret the growth of green jobs with one approach. Not only counting the quantity of jobs, but also meeting the aspirations of decent work, such as providing enough payment, is contradictive. It is argued that green jobs bring along remarkable economic costs for many countries. For instance, in Italy, the cost of creating one green job is approximately equal to the creation of five jobs. In Spain, each green job cost was identified as $860,000 (Ge and Zhi, 2016).

3.6 Overall Assessment of the Practices of Green Jobs

Even though the green job concept is relatively new, there are considerable studies that shed questions on how to accelerate the development of green jobs. The attempts for creating a clear understanding into both national and local contexts, have led to an emersion of different categorizations of different economic activities. Some studies bring the sectorial approach for preliminary analysis regarding the economic activities. The sectorial categorization can be found in the literature with different divisions. Different studies prefer to divide core or key sectors in different number of categorization including three, six, eleven or twelve or even twenty-two (WWF, 2009; Renner et al, 2008; ECO Canada, 2010; Pinderhughas, 2007).

Basically, the driver sectors for creating green jobs are defined as the energy, transport and building sectors according to WWF (WWF, 2009). More categorization can also be done by making a detailed analysis of economic activity areas according to the dynamics of countries and they can be detailed with different sectors such as water, waste management and tourism. ILO generally uses six-category for core sectors, that are agriculture and fisheries, energy, construction, transportation, tourism, water and waste management (Renner et al, 2008). However, studies should identify the core sectors according to the dynamics of the national contexts. For instance, ILO conducted the same assessment in eight categories for other countries (ILO, 2011a).

The key sectors of green jobs that are energy, transport and building sectors are further detailed with the purpose of giving insight about the related economic activities and their green jobs potential.

Energy has a significant role in the development of green jobs, through the increasing awareness on renewable energy. Solar energy and bioenergy are the primary sectors in terms of creating a large amount of employment globally. Green job activities are diversified from installation, to maintenance. According to IRENA, the number of jobs in the renewable energy sector was approximately 10 million in 2017, and it is expected to grow rapidly. Wind power presents a rising trend in terms of creating new jobs. Regarding the renewable energy capacity and the rate of investment to renewables, China, the United States, and Germany have come to the forefront as leader countries (IRENA, 2017).

The building sector has an important role in reducing the effects of climate change. Besides, predictions reveal that the population is going to increase sharply in the future. The need for new buildings will be in demand continually. Thus, for dealing with both demand and climate change goals, transition towards green buildings through retrofitting, replacing equipment or new construction activities that cares for the environment, should be demonstrated in a logical way. Green jobs activities range from construction, designing, drawing and certification processes. The issue of the green building sector is that they require special skills. Although recent numbers of jobs in global green building sector cannot be found, country estimations reveal positive impacts on the sector in the creation of jobs. To assess green buildings, some countries created a certification system. LEED is one of the well-known certificate system that was created by the United States. China is the leader country in terms of having the highest number of LEED certificated projects.

It is known that the proportion of the transport sector in the release of greenhouse gas emissions is also high (IPCC, 2014). If the cities continue with the existing car-oriented life style, the environmental damage will continue to stay at a very high level. That's why, cities are trying to bring sustainable urban mobility solutions with integrated pedestrian and biking facilities. Besides, through technological advances, it is possible to turn existing cars into more efficient vehicles in terms of carbon emissions (UNEP, 2011). The promotion of public transport instead of private car usage, and promoting electric cars or buses, will also increase green jobs in the transport sector. Although there is data limitation to estimate employment effects, ILO conducted studies on different regions and proposed that public investments can create 12.6 million jobs including operation, governance, and supply chain. However, they indicated that the ratio can change according to different regions (ILO, 2012c).

After specifying the activities of the green job, the problem of measurement of these jobs arises. Studies try to create methods to follow the preliminary analysis. Within this study, four main methodologies are presented that are derived from literature. The most recognized and comprehensive method was suggested by ILO. ILO created a guide to follow under five tasks. Each task is categorized with specific questions to be addressed. The tasks are tried to be applied in different regions and country (Andrew et al, 2009). The second method is Asian green job index, which is applied to Asian countries, including the following four criteria: green jobs market, green jobs post, labor availability, labor demand (Asia Business Council, 2009). The other method, which is BLS, suggests defining and measuring green jobs by dividing into two categories: output based and process based green jobs. By the national statistic department, every year and every quarter the data is collected and numbers are published (URL-12). The other US-based national statistical institute O*NET produced a definition on green jobs using three groups according to the skill level that are green increased demand occupations, green enhanced skills occupations, and new and emerging green occupations (Dierdorff et al, 2009).

When comparing the country practices all over the world, it is observed that countries attempt to develop their own national definitions and measurement tools. However, this is still an ongoing process. Besides, developing national definitions and integrated regulations have proven that there are already good cases for other countries to apply and adopt similar practices.

4. TURKEY’S POTENTIAL OF GREEN JOBS

In Turkey, likewise, other developing countries, the notion of green economy and green jobs are relatively new and discussing on the agenda. Considering the position of Turkey that is facing rapid population growth, it can be deduced that Turkey is also under threat of unemployment problem. In addition, according to ILO’s calculation, Turkey’s working age population is expected to increase each year by over 800,000 until 2020. For Turkey, climate change impacts are among the top concerns likewise other countries. Also, other challenges standout as rapid urbanization, increase in energy demand and high youth unemployment rate. When all these are taken into consideration, it is essential for Turkey to shape a policy framework that supports a green economy and a creation of qualified workplaces (ILO, 2015).

In this chapter, Turkey is assessed within the framework of green economy and green job potential. In this context, the current state of Turkey is investigated in terms of economic indicators and for this analysis, basic country level information on employment is obtained. Then, the political framework is revealed with respect to the sustainable development approach. National level policies are also examined for the purpose of finding a link between the green economy and the creation of green jobs. After that, the capacity of Turkey is tried to be estimated by following the ILO guide as a method. Considering Turkey’s dynamics and diver sectors of green jobs according to ILO studies, agriculture, energy, construction, and transport sectors are selected as key sectors for screening the potential of green jobs. The chapter is finalized with the summary of calculation while demonstrating sectorial opportunities that shed light on acceleration of the development of green jobs in Turkey.

4.1 The Outlook of Turkey’s Green Progress

According to the last census at the end of the year 2017, Turkey’s population reached to 80,810,525. In addition, the number of working age group that corresponds to the range of 15-64 has increased. The population pyramid shows that the working age group covers 68 percent of the total population while the population under 15 covers 24 percent and the population over 65 covers 8 percentage of the population. The proportion of age groups indicates that Turkey is a developing country with an expanding young generation capable of working (URL-19).

Gross Domestic Product (GDP) is the standard indicator that demonstrates the total value of all goods and services produced in country boundaries. This measure helps to understand national income or total expenditures regarding all products supplied in the economic boundary of the country. In Turkey, GDP was announced as 857.75 million US dollars in 2016 which is declining compared to previous years. However, only GDP is not an appreciated indicator to understand the level of the economy (OECD, 2018).

Labor market outlook depicts that there is a slightly rising trend in both employment and unemployment rate in Turkey. According to OECD data, Turkey's unemployment rate, which reached nearly to 11 percent, in 2017, is estimated to remain above this number. When compared to the OECD average trend, which is descending, the trajectory is seen as quite high (URL-13). The unemployment ratio in youth population between the ages 15-24 was announced as 24.5 percentage according to the Turkish Statistical Institute (TURKSTAT) census in January 2017 (URL-20). As a developing country with a growing young population, the unemployment rate is one of the priority issues to tackle within Turkey. Also, the labor force is above 50 percent in accordance with January 2017 statistics which is a promising measure (URL-19).

Meanwhile, the employment ratio of Turkey draws a slowly growing trend despite the fact that the proportion of employment is significantly below the OECD average. OECD predicts that the employment rate in Turkey will continue to grow at a slow pace as seen in Figure 4.1 (URL-13).

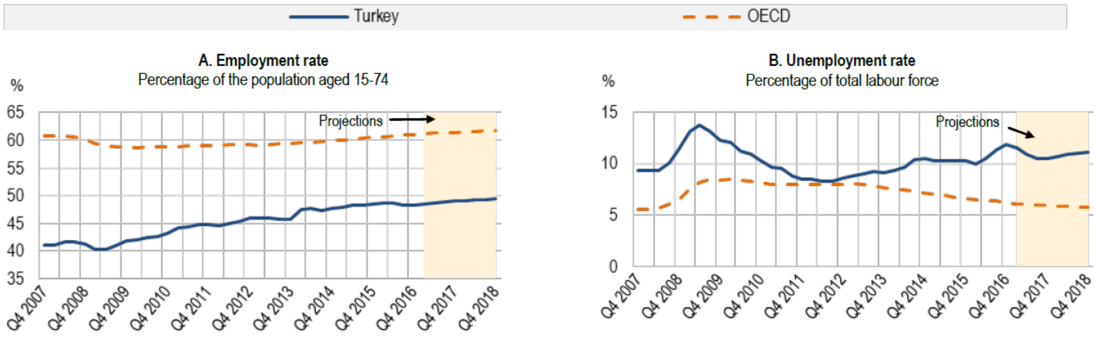


Figure 4.1 : Employment and unemployment rate of Turkey (URL-13).

OECD published a scoreboard including labor market performance that provides comparative outlook with various indicators beyond unemployment and employment rates. Measures are divided into three categories. One of the categories includes basic employment measures as employment and unemployment rates under the quantity title. The second one is named as job quality and includes wages, employment security, working environment. The last one presents labor market inclusiveness and covers income equality, gender equality, employment accessibility for potentially disadvantaged groups. The performance of the Turkish labor market was recorded and it is indicated that the current state of the working environment in Turkey is under the standards of OECD average in every category. The result of the measurements is illustrated in Figure 4.2 (URL-13).

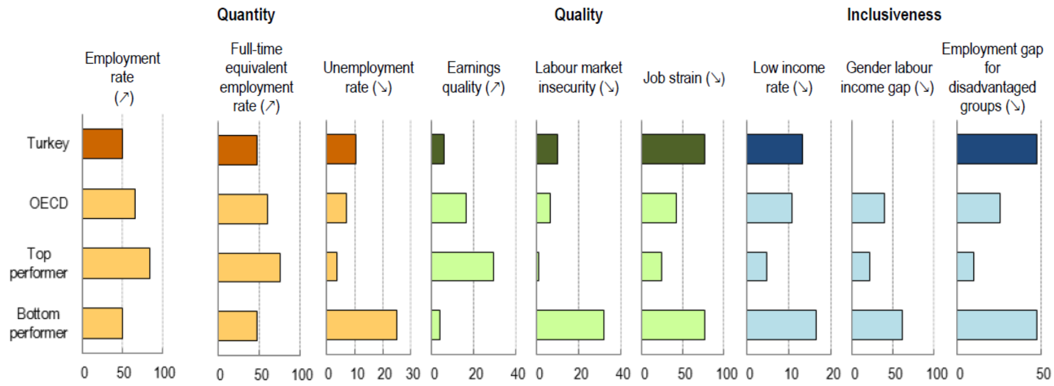


Figure 4.2 : Turkey’s performance in OECD scoreboard (URL-13).

OECD explained that there are some improvements in Turkey in terms of employment ratio. Although the earnings of employees have been increasing in recent years, job strain that means the percentage of workers in jobs do not meet the demand of jobs because few job opportunities are at the highest level among the other countries of OECD. Gender income gap is another risk issue for Turkey that needs to be taken seriously and data collection is essential in this respect. It is noticeable that social security and working conditions need radical improvements through prioritizing in legal regulations (URL-13).

OECD initiated Better Life Index, which is a web-based tool to provide a comparison for well-being across countries through many indicators. The index was established in May 2011 and includes 11 topics: community, education, environment, civic engagement, health, housing, income, jobs, life satisfaction, safety and work-life balance. Each topic has further detail and the data shows the level of achievements at country, city and regional levels (URL-21).

Recently, the performance of Turkey is slightly improving in terms of quality of life, according to the latest record in the index. Turkey has achieved an average rate in some indicators. However, Turkey performs under the OECD average in most of the measurements such as earnings, subjective well-being, environmental quality, work-life balance, housing and personal security. The outlook of Turkey's well-being inequalities can be seen in Figure 4. 3 (URL-21).

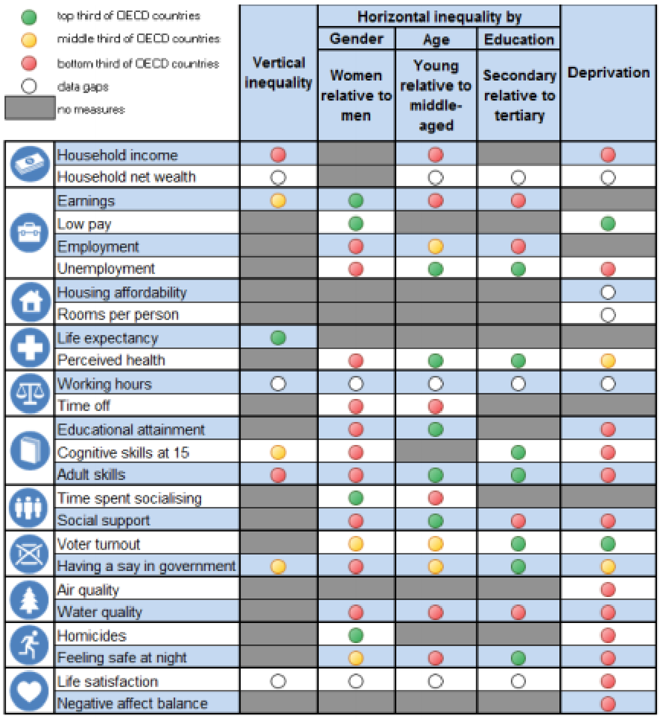


Figure 4.3 : Turkey's level of current well-being (URL-21).

As mentioned before, despite the fact that the employment ratio is quite good, it is still below the average number that is 67 percent. Besides, the job strain, which is a significant aspect of the employment quality, portrays the highest value in the OECD. Workers are uncomfortable with the high risk of expected earning loss when they are unemployed. As another quality indicator, the gender equality is another vulnerable issue in Turkey. Although between 2005 and 2012 female participation in labor force increased by over 50 percent, women in Turkey have had a very low ratio in employment (URL-21).

In addition, it is indicated that almost 34 percentage of workers dissatisfy to spend long hours in the workplace which causes damage to work-life balance. Education and skills are the most significant aspects of finding a job. Cognitive skills are under the level that is seen as important to find a job. The quality of the environment, which is mostly measured by air quality and the particular level, and water quality, are another risk points for Turkey. Overall, it can be said that the life satisfaction is lower than average according to Turkish people (URL-21).

In 2015, all member states of the United Nations set the goals and targets under 17 categories called Sustainable Development Goals (SDGs) for agenda 2030. All countries, both developing and developed, are expected to implement these goals within their policy framework. The SDG Index dashboard provides countries to compare SDG baselines and track their performance. In Figure 4.4, the results of 2017 performance in SDG index are illustrated by colors. The green color indicates achievements and red color indicates that the country is far away from achievement. Each goal in the SDG is examined country by country (Sachs et al, 2017).

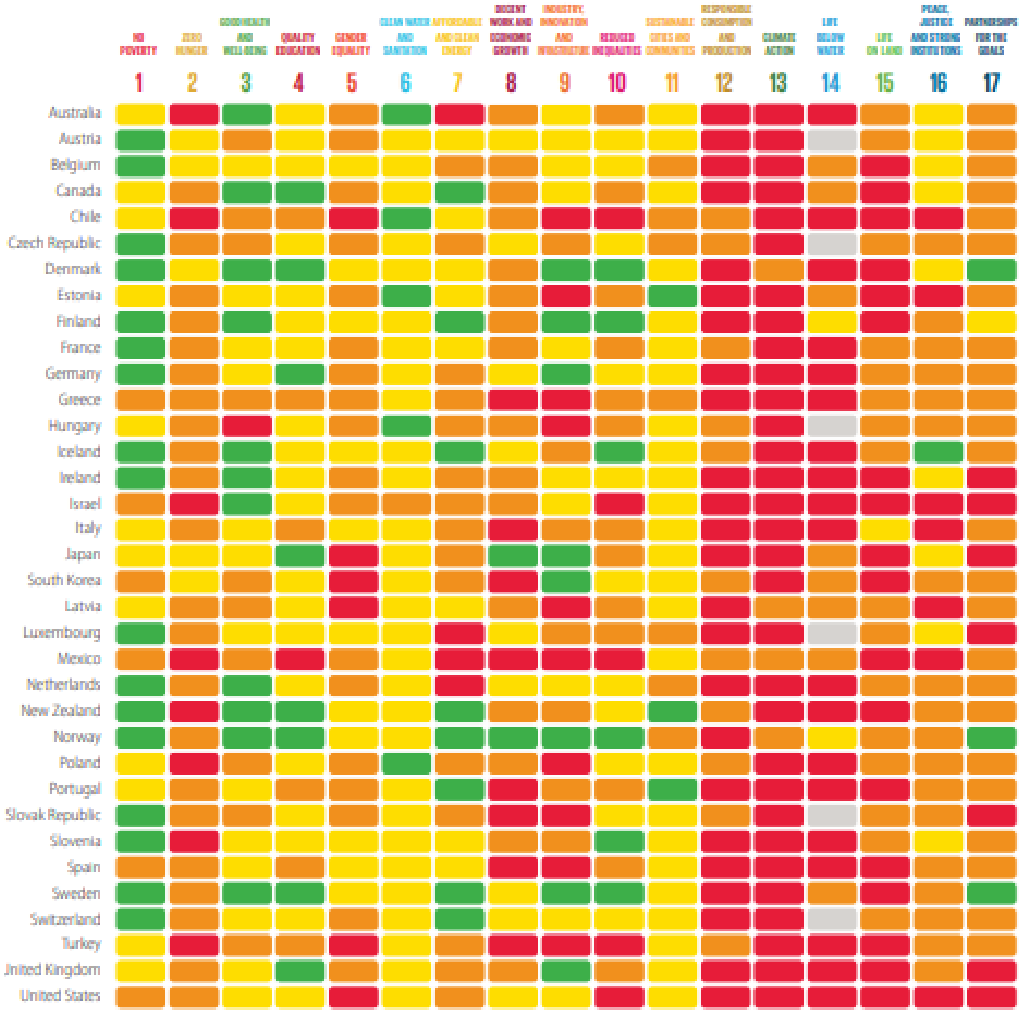


Figure 4.4 : 2017 SDG index dashboard (Sachs et al, 2017).

So far, every country including developed countries has struggled to meet aspirations indicated in the SDGs. Especially, subjects of sustainable consumption and production (SDG 12), climate change (SDG 13) and ecosystem conservation (SDGs 14 and 15) are found as the most difficult issues. The second compelling areas are related to decent work and economic growth (SDG 8) and gender equality (SDG 5). Notably, experiences to date have not been successful enough for eliminating high unemployment ratio and gender inequality. The 2017 SDG index report tries to give the impulse for countries to boost their studies on the subjects requiring greater efforts. In Turkey's framework, it is confirmed that the major shortfalls are in the subjects numbered as SDG 2, 5, 8, 9, 10, 13, 14, 15. Overall, Turkey takes 68th place among 150 countries with 68.5 points. Consequently, Turkey needs further progress on high-risk issues such as economic development and equity (Sachs et al, 2017).

OECD tracks the green growth progress for OECD and G20 countries, and it published the last version for 2017. The Green Growth Indicator 2017 report includes many measurements including environmental productivity, low land consumption, environmental innovation, taxation, GDP per capita, low-income inequality, demand and production-based CO_2 productivity and material productivity, and it is emphasizing the performance of 46 countries. Productivity is a prominent indicator that shows economic growth and increases the quality of life. Productivity level in Turkey is a bit progressed in comparison to the other indicators. Turkey portrays good performance at the expense of environmental quality. This situation emphasizes that there is an opportunity for attracting funds for increasing environmental capacity. However, Turkey is behind almost all countries about the progress in environmental technologies (URL-22).

OECD Economic Survey 2016 report has elaborated green growth measurements and presented that the environment-related investments are at a low level comparing to the OECD average. The level of performance indicators related to green growth is shown in Figure 4.5 (URL-23).

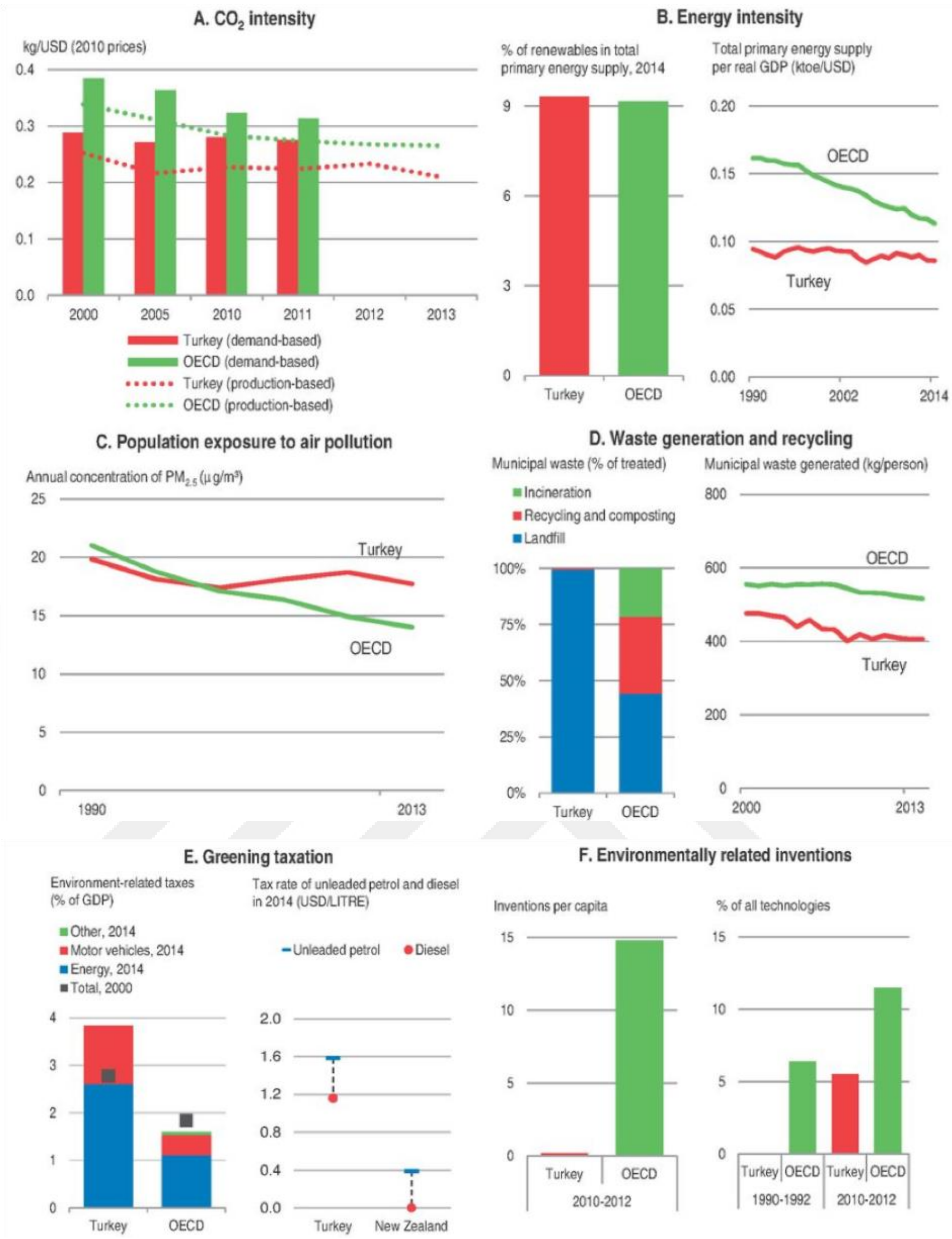


Figure 4.5 : Green growth indicators for Turkey (URL-23).

The Global Green Index (GGEI) is a performance indicator of the green economy, which is launched by Dual Citizen LLC in 2010. The content of 2016 GGEI contains 80 countries' evaluation and their perception scores. The report sheds light on the green economy level regarding four dimensions that are leadership and climate change, efficiency sectors, markets and investment, environment and natural capital. Besides the performance index, the research presents a perception survey to grasp a practical understanding of the topics. The report portrays Turkey's results in both perception and performance rank as shown in Figure 4.6 (Tamanini, et al, 2016).

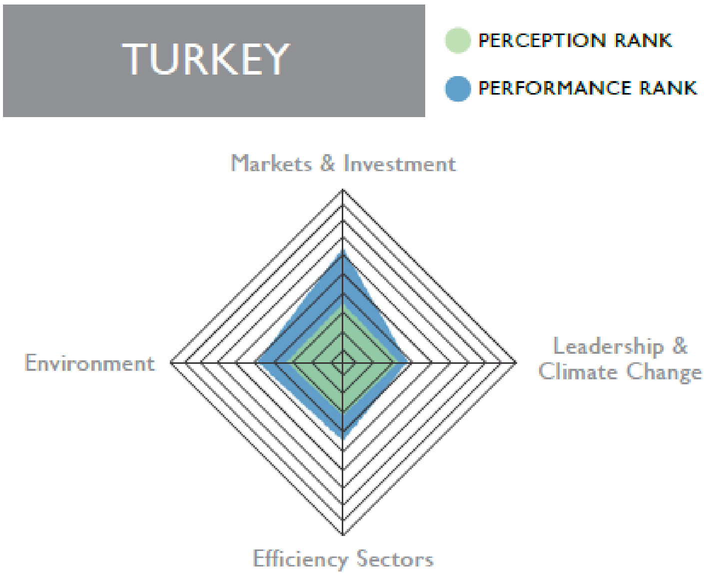


Figure 4.6 : 2016 GGEI result of Turkey (Tamanini et al, 2016).

In overall, Turkey's GGEI performance score indicates that the country is at a medium level as 40th in 80 counties, while perception rank is 54th. The result of the market and investment dimension demonstrated an improvement in Turkey's condition in comparison with the previous calculation in 2014. Turkey has gained attraction in the area of renewable energy investment and the country leverages corporate's sustainability and green financing facilitation. In leadership and climate change dimension, Turkey remains at a low level due to the recent political instability that causes insecure market environment. The report suggests that leadership and climate change topics should be prioritized as well as environment dimension on which Turkey's result fall behind (Tamanini, et al, 2016).

4.2 Turkey's Green Policy Framework

In Turkey, national development plans have been initiated by State Planning Organization since 1960 and environmental vulnerability subject was mentioned in the first three of the national development plans. In 1998, the National Environmental Strategy and Action Plan was announced and it has been a milestone for sustainable development for Turkey. In 2002, Turkey took place in the international arena which is the United Nations World Summit on Sustainable Development and presented the Sustainable Development National Plan. After that, in 2006, the Environment Law was released that focused on protection of plants and animals. Responsible legal entities for environment-related subjects are Ministry of Environment and Urbanization, Ministry of Forestry, Ministry of Food, Agriculture and Livestock, Ministry of Development, Ministry of Energy and Natural Resources and their sub-departments related with protecting the environment and facilitating the transition to green and low carbon-economy (Aydın and Turhan, 2016).

The international agenda has affected the development of national enforcement progress through commitments. In this context, national development plans, strategical documents, and regulations are investigated after 1998. Below, the revised document list published or supported by government is presented. Besides, some important studies, which intended to contribute national strategic framework and shed light on the current assessment of Turkey in terms of sustainability level, are also considered.

- 7th National 5-year Development Plan (1996-2000)
- 8th National 5-year Development Plan (2001-2005)
- 9th National 5-year Development Plan (2007-2013)
- 10th National 5-year Development Plan (2014-2018)
- National Environment Strategies and Action Plan (1998)
- Waste Management Action Plan (2008-2012)
- National Climate Change Strategy (2010-2020)
- National Rural Development Strategy & Plan (2010-2013)
- Turkey Industry Strategy Report (2011-2014)
- National Climate Change Action Plan (2011-2020)
- Turkey Sustainable Development Report Claiming the Future 2012
- Turkey Green Growth Policies (2012)
- Energy Efficiency Strategy (2012-2023)
- Regional Development Strategy (2014- 2018)
- National Energy Efficiency Action Plan (2017-2023)

From National 5-Year Development Plan, it can be deduced that the sustainable development approach gained importance with 7th National Development Plan (T.C. Kalkınma Bakanlığı, 1995). In 8th Development Plan, a sustainable development approach was approved in almost every sector and sectoral strategies were structured within the approach. Some examples were seen as follows; development of renewables in the energy sector, decreasing emission in the transport sector, job creation and protecting the environment in the industrial activities. Also, environmentally friendly technologies, innovative environmental R&D activities and related emerging jobs were supported (T.C. Kalkınma Bakanlığı, 2000). In the 9th Development Plan (2007-2013), the focus was on maintaining sustainable development principles by supporting the integration of sectors. In addition, employment-based sustainable growth, improving the labor quality and skill level were prioritized under the economic and social development axis. These priorities indicated a link between green jobs and decent work policies (T.C. Kalkınma Bakanlığı, 2006). In the 10th Development Plan, which was more comprehensive and people-oriented, supported and promoted green jobs indirectly. Green growth approach was taken place directly. In addition, promoting environmentally friendly products and supporting new employment areas that provide environmentally friendly economic development were stated as important policies. When combining policies on supporting renewable energy, resource efficiency, environmentally friendly products and technology and quality of employment give direction about the green jobs development indirectly (T.C. Kalkınma Bakanlığı, 2013).

The content of other documents demonstrates the attempts to improve Turkey in terms of green economy and job creation through prioritizing renewables, energy efficiency, recycling, and employment skill development in both national and sectoral levels. Besides, National Industry Strategy Report directly stated that the green occupations and new employment areas can be supported in renewable energy, energy efficiency, environmentally friendly technologies and similar content firms (T.C. Sanayi ve Ticaret Bakanlığı, 2010). In addition, in the National Climate Change Action Plan (2011-2020) green jobs can be seen as an advantage supplied by some actions. Moreover, in Turkey, Sustainable Development Claiming the Future 2012 declared the importance of green jobs development (T.C. Çevre ve Şehircilik Bakanlığı, 2011).

Although the green jobs concept is very new, the private sector is more familiar due to the issue of competitiveness. It is known that every year Green Jobs Conference was organized by an NGO named Sürdürülebilirlik Akademisi (URL-36).

4.3 Estimating Green Jobs Potential in Turkey

There are very limited studies about the estimation of green jobs potential in number. As the green approach is tried to be adopted into strategic reports of national and private sector institutions, green jobs are expected to grow. Turkey has some sector-based employment estimation especially in renewable energy, solar energy, wind energy, therefore it can be understood that the consciousness of green jobs has been spreading.

Baykan (2009) presented a study note that indicated data limitation. The study was structured with environmental public expenditures of Turkey. Ercoşkun (2010) discussed green jobs in Turkey by indicating environmental investment statistics of public institutions. In addition, the study showed the number of engineers, architects, and urban planners registered Union of Chambers of Turkish Engineers and Architects (TMMOB) and counted them as possible direct green job workers, which are 269,279 in 2009. Also, a number of private companies and NGOs working in favor of environment were collected. Related department of universities or vocational schools program was also expected to accelerate the expansion of green jobs. Özsoy (2011) mentioned about skill gap that is possible to occur in the transition process towards green jobs. Topgül (2015) proposed that green jobs are a tool for the solution of unemployment and examined a city of Tokat in Turkey, looking into a number of employee in power plants located in the city. But in this subject, the most comprehensive study was conducted by Yılmaz Arlı (2014) which is a dissertation developed under the Ministry of Development of Turkey. After looking at the whole concept of green jobs, she focused on the renewable energy sector and predicted the potential green jobs development including three different scenarios and statistical measurements. The scenario with ambitious targets demonstrated that 2,229,534 jobs could be supplied in between 2013-2030 (Yılmaz Arlı, 2014).

In this study, the subject of how many green jobs can be created in number within the boundary of Turkey is investigated through ILO's green jobs guide methodology, which is explained more detailed in the following sections.

4.3.1 Methodology

Green jobs can take place in all sectors and industries. However, this study details it further in driver sectors, which have the real potential to boost a number of green jobs.

The method is explained by ILO for green jobs mapping studies. For the methodology, five tasks are identified to reach the result that is shown in Table 4.1 (ILO, 2014). In this study, the methodology adjusted like ILO did for the countries with limited data.

Table 4.1 : Five tasks of ILO methodology (ILO, 2014, p. 4; ILO, 2014a, p.6).

Task	Description	Output
Task1	Understanding the overall structure of the domestic economy and total employment	Overview of the economic structure
Task2	Developing screening criteria that support 'core' environment related works and decent work	Propose core sectors via screening criteria
Task3	Identifying economic activities that support "core" environment-related employment	Define economic activities and estimates of green jobs
Task4	Screening "core" jobs using decent work criteria	Review core sectors with decent work criteria
Task5	Analyzing green jobs	Summarizing potential capacity of green jobs

In this study, there is no big differences from the original one in the content of modified tasks' steps. Task 1 and 2 are the same as the original methodology. Task 1 contains an overview of economic and employment structure by using widely accepted indicators. As Task 2, development of screening criteria and deciding on the core sectors, which can be identified as driver sectors or supported ones according to the country's dynamics, are the following steps. Screening criteria are constituted by overlapping the dynamics of Turkey in terms of the legal framework and public or private institutions' strategic targets.

As Task 3, core sectors are examined to decide which economic activity in the sector is environment-related. ILO's previous studies and long-term effect categorization of green jobs are considered in the process of selection. This step can be supported by interviews and workshops to which related stakeholders can participate. Also, using environmental standards while screening sub-sectors are expected. In this step, the result of screening economic activities in core sectors are accepted as environment-related economic activities as well. Applying the decent work criteria is very challenging for countries that suffering from lack of data. The original method recommends the application of decent work indicators to select sub-sectors. However, this study applies decent work indicators to core sectors instead of defined economic activities because of the data availability. The final step summarizes all the calculations and demonstrates the capacity for green jobs. The capacity of green jobs in the selected economic activities is calculated by using basic regression referencing employment factor. In the calculation part, the original method recommends using complex methods such as I-O tables.

4.3.1.1 Developing screening criteria

The indicators of screening criteria of selected sectors corresponde to environmental impacts including mitigation actions, adaptation activities, ecosystem protection, water management, pollution control, environmental compliance, education and training, and public awareness. Screening criteria for environment-related jobs in selected sectors are recommended as following steps (ILO, 2014):

- First, screening criteria investigate international and national environmental laws. Activities cannot be taken into consideration if they are not suitable for national laws.
- The second step is to examine the sector with other standards which structured with voluntary environmental standards and related sustainable management.
- Screening all the present national or local and public or private strategic plans related to environmental management is the third step.
- As a fourth step, comparison of the performance evaluation or threshold for sectors is considered. If the standards are missing in the context of the country, researchers suggest evaluating the situation with what makes the good in environmental performance.
- The last step is based on activities that are taken into consideration with the level of created environmental jobs despite low resource.

In the context of this study, national and international environmental standards and priorities, private and local strategic plans are considered for screening sectors. Deciding environment-related economic activity is based on ILO's former studies, green jobs assessment reports applied to different countries and the sectorial long-term effects to create green jobs developed by ILO and UNEP.

4.3.1.2 Decent work criteria

ILO has developed decent work criteria that seek to support main human rights in working environment such as equity, security and dignity. Decent work concept emphasizes productiveness, equal income and opportunities, security and social protection, personal development and social inclusiveness in the working places. To evaluate the progress of decent work in Turkey, the labor force is monitored by using the criteria adopted for Turkey from ILO's decent work criteria list (ILO, 2014):

- Informal employment rate,
- Working hours,
- Gender ratio,
- Social security,
- Social dialogue (number of registration in worker's union)

4.3.1.3 Estimating green jobs

ILO characterizes estimation of green jobs with regard to two aspects. The workforce is considered as green jobs when two aspects merge at the same point as shown in Figure 4.7. These two aspects, namely the environment-related jobs and decent work, have different selection criteria (ILO, 2014). Green jobs should meet each of the criterions of these two aspects.

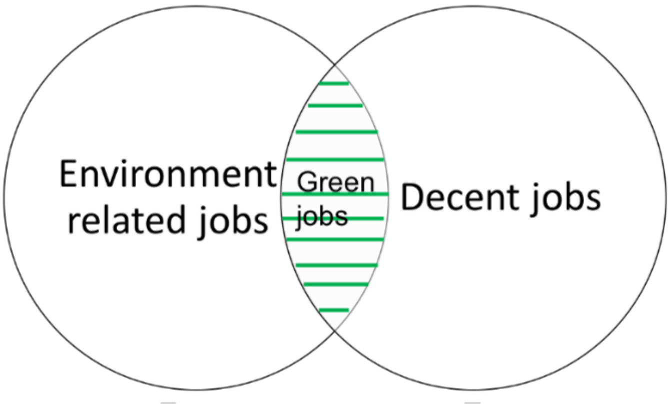


Figure 4.7 : Estimating green jobs (ILO, 2014, p.9).

For measurement, mapping green jobs is also supported by surveys for collecting reliable data from all sectors. However, rather than mapping, desk review approach is followed due to the data limitation. In the context of this study, the barrier of data deficit is exceeded by using ratio and assumptions. Using ratios is the most preferred option for basic calculation. In addition, assumptions can also be applied when there are former studies showing defaults or constant values. However, in this study, assumptions are mainly done with regard to other countries' experiences. Local factors should also be considered while making an assumption. Thus, the reliability of the result is controversial although it can be enhanced with surveys and focus group meetings (ILO, 2014).

4.3.1.4 Data

To reach an accurate result depends on obtaining the right data. Lack of data causes an important limitation to design the structure of the analysis. Project-specific data can be collected by one person although national level data requires much more effort. The manner of the policymakers in a country affects the data collection process and decisions on which data should be collected and published. Sharing the data is a significant aspect for reliability and transparency of government. Updating data is another important point that helps to show the real and most current situation. Thus, all the policymakers should have the same attitude in the data collection processes.

In this study, data is collected from national resources and websites. Reaching the most updated preliminary and secondary data was taken into consideration, however; the Turkish manner in national-level data collection, especially the data related to sustainability issues, is problematic. In addition, updating and sharing the data is generally missed out. Table 4.2 shows the data info that is used in the estimation of addible green jobs capacity.

Table 4.2 : Information about data in the method (Prepared by the author)

Data category	Last data collected date	Source
National-level employment related data (labor force, employment, unemployment)	2017	TURKSTAT www.tuik.gov.tr
Employment in economic activities within NACE codes, males, and female ratio in the employees	2017	TURKSTAT www.tuik.gov.tr
Informal employment	2017	TURKSTAT and Social Security Institution http://www.sgk.gov.tr/wps/portal/sgk/tr/calisan/kayitdisi_istihdam/kayitdisi_istihdam_oranlari/kayitdisi_istihdam_orani

Table 4.2 (continued) : Information about data in the method (Prepared by the author)

Data category	Last data collected date	Source
Average working hours	2016	TURKSTAT www.tuik.gov.tr
Labor union	2017	https://www.csgb.gov.tr/home/contents/ istatistikler/iscisendikauyesayilari/
Organic farming (production capacity and number of farmers)	2016	TURKSTAT http://www.tarimsalistatistik.com/tr-TR/organik-tarim
Installed renewable energy	2016	TETAŞ
Number of employment in renewable energy	2017	IRENA
Green/certificated building numbers	2017	ÇEDBİK https://cedbik.org/tr

For the estimation of addible green jobs capacity, the target is set up based on the national target's and years. The addible green jobs number interval is considered between the present/updated data and the data dated to 2023, which is the base year for many political indicators of Turkey.

4.3.2 The overview of the employment structure in Turkey

The employment and economic structure is investigated as Task 1 mission, which corresponds to the question of "what are the overall structure of the domestic economy and total employment?" (ILO, 2014). In the content of Task 1, overall basic economic information such as total jobs by sectors, labor force, employment, unemployment is collected. The preparation of the profile is formed by giving the employment share that emphasizes primary sectors and informal activity in the total economy.

In order to understand the employment structure in Turkey, national level labor statistics are presented in Table 4.3.

Table 4.3 : Labor force statistics of Turkey (URL-24)

Years	Population 15 years and over	Labor Force	Employed	Unemployed	Not in labor force
2009	51 833	23 710	20 615	3 095	28 124
2010	52 904	24 594	21 858	2 737	28 310
2011	53 985	25 594	23 266	2 328	28 391
2012	54 961	26 141	23 937	2 204	28 820
2013	55 982	27 046	24 601	2 445	28 936
2014	56 986	28 786	25 933	2 853	28 200
2015	57 854	29 678	26 621	3 057	28 176
2016	58 720	30 535	27 205	3 330	28 185
2017	59 894	31 643	28 189	3 454	28 251

In Turkey, the large proportion of population corresponds to the workforce, which is described as the ages between 15-64. Over the half of the population of nearly 80 million people has the ability to be productive, which can also be seen as a labor force in Table 4.3 derived from TURKSTAT’s labor force statistics. Although the most of the labor force is employed, it is noticeable that not in labor force statistics are also quite high (URL-24).

Turkey draws a growth path in the labor force participation rate between 2007 and 2016. However, after the year 2012, the unemployment rate started to increase notably and it continues to rise. Increase employment rate and declining unemployment needs to be a topic that requires a sensitive approach.

Besides, it is remarkable that there is a gender inequality in Turkey’s labor force. When comparing to the ratio of labor force participation, the female rate is nearly 34 percent and the male rate is nearly 73 percent according to the TURKSTAT counts in 2017. The inequality is seen in every category of jobs in the working environment in Turkey. For instance, the female unemployment rate is almost 15 percent while the male unemployment rate is almost 8.5 percent.

Moreover, the youth unemployment rate is increasing in Turkey. Within the youth unemployment ratio, the proportion of unemployed young females are approximately 27 percent and the ratio of unemployed young males is 20 percent. Neither employment nor education rate are again high in women’s portion (36%) when comparing to the men’s ratio (16.2%). All the statistics prove the existence of the inequality problem in Turkey (URL-24).

In Turkey’s employment profile, the unregistered work ratio also stands out as an important issue. According to the household labor force research conducted by TURKSTAT in 2015, the unregistered employment rate was 33.6 percent. The agriculture sector has the largest proportion with 81.2 percent. When looking at the age category, the highest level of unregistered work is observed in the ages between 15-19. Also, the female ratio in unregistered employment is higher than the male’s (URL-25).

About the child labor force, General Workers Union published a report in 2016. According to the report, there were approximately 2 million children in the working environment. In addition, around 80 percent of child workers were employed out of standards. It is stated that the number of child labor has been increasing since 2012. According to 2016 records, the number of child labor between the ages 15-17 was recorded as 709 thousand. In fact, the number is contradictive because it is highlighted that some agricultural workers' children and apprentices are not included in the counts due to the rough calculation (Yıldız and Yıldız, 2017).

Turkey adopted a classification on economic activities according to the European Union's economic activity statistic classification (NACE). According to TURKSTAT, economic activities by years are demonstrated in Table 4.4 (URL-24).

Table 4.4 : Economic activities in Turkey according to Nace Rev.2 (thousand people) (URL-24).

	Nace Rev2 Sectors	2009	2010	2011	2012	2013	2014	2015	2016	2017
Agriculture	(A) - Agriculture, forestry and fishing	5240	5683	6143	6097	6015	5470	5843	5305	5464
Industry	(B) - Mining and quarrying	97	115	125	113	105	134	118	125	137
	(C) Manufacturing	3870	4216	4367	4420	4632	4936	4956	4915	4969
	(D+E) Electricity, gas, steam, water supply, sewerage etc.	112	165	212	218	218	245	257	257	277
Construction	(F) Construction	1306	1431	1676	1709	1782	1912	1914	1987	2095
Services	(G) Wholesale and retail trade	3381	3326	3476	3502	3518	3586	3692	3758	3934
	(H) Transportation and storage	986	1009	1044	1095	1152	1119	1108	1185	1235
	(I) Accommodation and food service activities	1049	1084	1141	1206	1308	1351	1449	1471	1523
	(J) Information and communication	157	204	211	238	254	227	251	248	258
	(K) Financial and insurance activities	273	273	280	264	288	301	294	301	271
	(L) Real estate activities	63	61	154	184	186	205	212	242	286
	(M) Professional, scientific and technical activities	398	429	427	507	553	684	750	846	895
	(N) Administrative and support service activities	599	766	777	924	1020	1154	1291	1397	1551
	(O) Public administration and defence	1207	1292	1337	1458	1462	1384	1441	1453	1462
	(P) Education	967	1019	1106	1224	1247	1320	1411	1607	1608
	(Q) Human health and social work activities	591	590	693	808	858	972	1051	1123	1187
	(R)– Arts, entertainment and recreation	130	102	100	108	121	131	149	141	154
	(S+T+U) Other social, community and personal service activities	849	831	840	748	804	800	793	844	883
	Total	21277	22594	24110	24821	25524	25933	26621	27205	28189

As seen in the table, the agriculture sector is still dominant even if the sector has steadily increased. Almost all the sectors have risen their employment capacity.

According to 2017, Turkish Labor Market Research conducted by Turkish Business Agency, the vacant rate for work is identified as 2.7 percent. It is observed that there are difficulties in finding staff in professions that generally require qualifications and skills in the labor market. Apart from these professions, the number of intermediate staff is also received attention. While the quality of current employees is low, the level of qualification required in the professions is higher. The skill is another issue in Turkey's employment profile (İŞKUR, 2017).

4.3.3 Proposed core sectors and economic activities

To estimate environment-related employment in the Turkish economy, the sectors are examined regarding their relationship with the environmental protection. It is attempted to discover what the environment-related economic activity and employment in the economy is (ILO, 2014). In this point, screening criteria are used for assessing the sectors. In the content of this study, screening criteria are mainly constituted by the basic environmental targets such as sustainable activities, products, and services through justification from national governance plans. Besides, strategic plans of private and local governments are taken into consideration.

In addition to the Turkish legal framework, the content of the ILO's previous studies is considered. Comparison to the ILO's green jobs assessment reports shows that agriculture, forestry, fisheries, energy, water and waste management, manufacturing, transport, construction are the prominent sectors (ILO, 2011b; 2013a; 2014; 2014a; 2014b).

UNEP and ILO, within the partnership of ITUC and IOE, initiated to develop a theoretical background for green jobs concept and presented long-term and short-term green jobs' potential by sectors and employment activity. When crossing the sectors with ILO's sectorial green jobs progress, agriculture, buildings, transport, energy sectors have proved to have excellent progress in the long term (Renner et al, 2008).

In Turkish context, after scanning national and international perspectives in climate change action plans and development plans, agriculture, construction, transport and energy sectors are selected for environment-related employment sectors and economic activities (T.C. Kalkınma Bakanlığı, 2013; 2014; Çevre ve Şehircilik Bakanlığı, 2011; 2012). Although industry and manufacturing have a higher proportion in the Turkish economy, the industry and manufacturing sectors are excluded from the environment related sectors due to the potential process guidance of ILO.

Furthermore, organic agriculture, green building, bus network, solar and wind energy are selected for green economic activities based on screening criteria developed above.

4.3.4 Estimating green jobs potential in selected sectors

For initial measurement of Turkey's capacity, the study tries to suggest the numbers about the capacity in selected sectors regarding the future development targets.

4.3.4.1 Agriculture

The agriculture sector is one of the focal economic activities in the context of Turkish policies. The scan on the employment profile indicates that agriculture is the main sector for rural areas in Turkey. Turkey is counted among the top ten countries in the agricultural economy. The sector still holds a large number of workers with nearly 8 percent of the total GDP although it portrays barely a rising trend in terms of GDP growth and share. However, the importance of agriculture still continues for economic growth and rural development in Turkey. Turkey plays an important role as a producer in various kind of agricultural outputs (World Bank, 2013).

Following the greening and sustainability vision, agriculture has a great potential for promoting soil conservation and encouraging sustainable irrigation systems. By doing so, it prevents the inefficient use of resources. National and regional development plans also support the sustainable agricultural production processes (T.C. Kalkınma Bakanlığı, 2013; 2014; Çevre ve Şehircilik Bakanlığı, 2011; 2012). Aşıcı A. and Şahin (2017) suggested some policies for agricultural and rural policies in terms of combating climate change and the adaptation process. Organic production, urban farming, eco-villages and slow cities are recommended for shifting towards a green economy. Also, there are already some initiatives to support organic farming in the cities of Turkey. This potential and compatibility with national laws lead to select agriculture as one of the key green sectors (World Bank, 2013).

Organic agriculture is compatible with Turkish national policy framework and it is included in the specified targets. Besides, in ILO's table of green jobs potential, organic agriculture is one of the subsectors that has excellent long-term potential in the agricultural sector (Renner et al, 2008). Thus, organic agriculture is selected as a core subsector.

In Turkey, organic farming activities started at the 1980s with the export-oriented crops such as dried figs, dried apricots, and nuts. In the first period of organic farming (1984-1993), there were no national legal arrangements. In the second period (1994-2002), a number of developments have taken place at the level of regulation, and organic farming activities started to develop and spread especially in the Aegean region. From 2003 to the present, organic farming has enhanced with legal-based support. The Organic Farming Law was published on 03 December 2004 and the Regulation on the Principles and Implementation of Organic Farming was put into force on 10 June 2005.

After 2005, goals related to organic agriculture have continued in the various national development plans as well. The Ministry of Food, Agriculture, and Livestock announced its 2013-2016 Organic Farming National Action Plan. Also, organic farming policies and targets are presented in the Ministry's 2013-2017 Strategic Plan. Organic farming takes part in the 2014-2020 National Rural Development Strategy as proposed criterion within the target of supplying sustainability in soil and water resources (Güresinli, 2015).

Screening through decent work criteria, the agriculture sector is evaluated with informal employment, average working hours, the equity of gender and wage, social standards and social dialogue rates rather than organic farming, which is selected for green jobs due to the data limitation.

It is known that agricultural sector holds the highest number in the unregistered worker rate which is recorded as 83.3 percentage in 2017 among the other sectors compared to the average number (34 percentage) (URL-29). In terms of average working hours, TURKSTAT announced that sectorial average for weekly working hours for agriculture in 2016 was presented at the lowest level due to the seasonal working hour difference (URL-35). To assess gender inequality, the number of employees per gender is compared. It is seen that men are dominant in the sector due to fact that most of the women work as informally or they are accepted as unpaid family worker according to 2017 census of TURKSTAT (URL-24).

As all the national and international standards related to organic agriculture are required in the control and certification process of every stage from production to farming to culinary, the organic farming system is at the highest level in traceability and reliability among the agricultural activities (URL-28). From this point, the sub-sector meets the categorization in the field of environment-related employment even though the decent work criterion cannot be applied directly. Although the decent work scanning of agricultural sector shows a negative situation, organic agriculture is assumed to get through all drawbacks via certification.

In the following years, the national organic product range has been expanding via the rising level of consciousness. Organic products have begun to take part in demand within the boundary of the country as well as abroad (URL-27). According to TURKSTAT data presented in agricultural statistic's website, production capacity is rapidly increasing as well as the number of farmers that are shown in Table 4.5 below (URL-26).

Table 4.5 : Organic agriculture statistics in Turkey (URL-26).

Years	Products (Number)	Production (Tone)	Area (Ha)	Farmer (Number)
2002	150	310,125	89,827	12,428
2008	247	530,224	166,883	14,926
2014	208	1,642,235	842,216	71,472
2015	197	1,829,291	515,268	69,967
2016	238	2,473,600	523,777	67,878

It is revealed that the capacity of production is increased very fast recently. This situation can be expressed as people has realized the importance of organic production as well as policymakers (URL-26). There are some supportive programs provided by Ministry of Food, Agriculture, and Livestock such as low-interest investments and business loans, giving priority to farmers engaged in organic agriculture in the project supports, soil analysis, renting public land (URL-28).

Besides, there are 36 organizations that are responsible for certification and supervision recognized by Ministry of Food, Agriculture, and Livestock (URL-26). This situation reveals that organic agriculture serves as having great potential for indirect jobs opportunity as well.

Considering decent work criteria in specific organic agriculture, it is claimed that the growth of organic farming leads to the decline of informal employment and to a shift from seasonal to full-time employment (Duvar, 2013). There is no data about informal activities in organic agriculture. Due to the certification and control mechanism, it is assumed that the sector portrays proper profile in the formal employment.

In gender equality, there isn't any information. A study focus on women in rural in terms of working in organic farming showed that women who have a high education level and also younger ones have preferred to work. On the other hand, men have lower education level, bu they earn higher wages than women (Duban et al, 2016).

Recently, the number of farmers in organic agriculture comprises only 1.2 percent of the agriculture sector with 2 percent organic agriculture land capacity. Turkey targets to enlarge the agricultural land for organic farming to 5 percentage in 2030.

In this sector, the land-based employment factor is applied for estimation of the number of people that can work with the targeted expansion of land. For the employment factor, it is acknowledged that organic agriculture employs more labor ranged from 7 to 75 percent than conventional agriculture anywhere. Although the statistic can change according to farm size and products (Finley et al, 2017).

In this study, the value of Maynard and Green's (2006) survey-based study is indicated that between 9 and 34 percent more jobs per hectare is observed in organic agriculture. While reviewing former employment and land area data for organic agriculture and agriculture, it can be expressed that the number of jobs per hectare is decreasing in Turkey. Thus, using lowest employment factor of Maynard and Green's study is chosen to estimate green jobs creation in the related economic activity. Considering the expansion rate of the land area up to 2023 target, basic correlation is applied to find expected land area in the unity of hectare. The 2023 target is 5 percent. Through assuming agricultural land area will not change in 2023, via applying basic ratio and proportion approach approximately 1,310,000 (523,777*5 /2) ha is found as organic farming area in 2023. After finding a land area for 2023, employment per hectare is structured for Turkey's situation. Basically, the targeted land area has the opportunity to serve for 117,900 (1,310,100*0.09) green jobs in total within 9 percentage employment factor. As this study focuses on the addible part of jobs, the capacity that Turkey to create green jobs is estimated as approximately 50,000 (117,900 - 67,878).

4.3.4.2 Energy

The demand and consumption ratio of energy resources have been increasing due to the rapid urbanization and population increase. Moreover, globalization has a negative effect on environmental resources that causes big problems for all societies. Because of harmful effects on limited resources, the world has begun to search for alternatives for energy production systems, which are harmless for the environment. Thus, the emergence of using renewable energy resources such as solar, wind and geothermal are seen as key for solution and they are seen as environmentally friendly (Ürün and Soyu, 2016).

Turkey is a foreign dependent country on energy. Using local and alternative energy resources has an important effect on decreasing dependency, providing energy security and contributing to the youth unemployment problem. Turkey has a great potential in terms of renewables, particularly in hydropower, wind, solar, biomass and geothermal energies. However, Turkey does not use its real capacity in renewables (Aşıcı A. and Şahin, 2017).

Turkey's current primary supply of energy depends on fossil fuels including coal, natural gas, and oil and they all constituted approximately 90 percent of total energy supply. As a developing country, the energy demand is growing and it is expected to increase nearly by 6 percentages per year until 2023 (Kaplan, D., 2015). According to TETAŞ (2016), electricity production was 273,387 GWh at the end of 2016 and 184,889 GWh of this total electricity production is supplied by thermal power plants, 67,268 GWh is supplied by hydroelectric power plants and 21,230 GWh is supplied by other renewable energy sources. Our geothermal and wind-based production of renewable energy sources have increased significantly over the last decade and reach to 21,230 GWh from 511 GWh levels. In the same period, the electricity generated from thermal power plants increased by about 20 percent while the energy produced from hydraulic power plants increased by 87 percent. All these statistics illustrate that the share of the renewable ratio is so small in meeting the need for national energy demand as it is seen as in Figure 4.8 (TETAŞ, 2016).

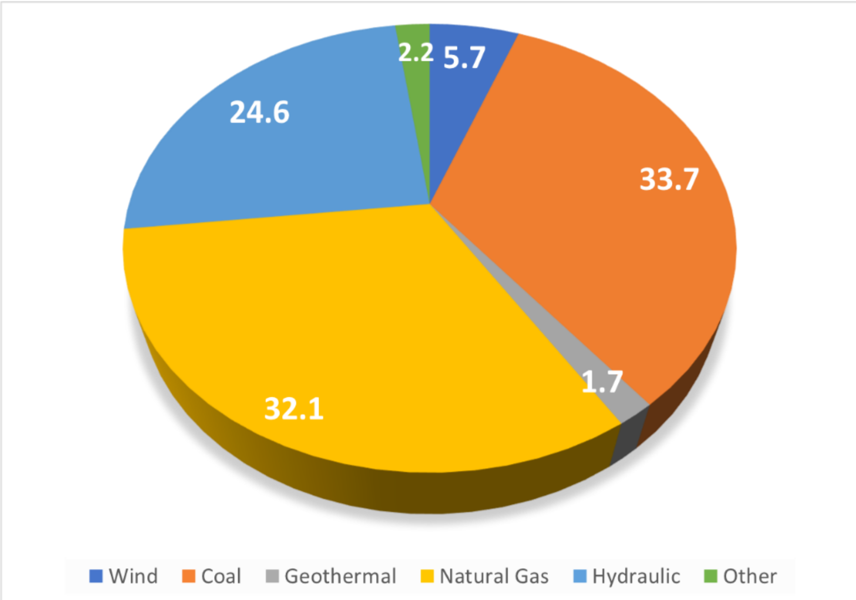


Figure 4.8 : Turkey's resources-based electric energy production in 2016 (TETAŞ, 2016).

In terms of installed capacity (MW), it is also observed in Table 4.6 that, almost 60 percent of the total installed power comes from thermic energy production. It is noticeable that solar energy production started to be seen after 2013 and the share of wind energy is very small (TETAŞ, 2016).

Table 4.6 : Turkey's year based installed capacity (MW) (TETAŞ, 2016).

Years	THERMIC			Hydraulic	Wind	Geother mal	Solar	Total
	Coal	Natural Gas	Other					
2002	6,983	8,438	4,147	12,241	18,9	17.5	-	31,846
2003	8,239	10,053	4,683	12,579	18,9	15	-	35,587
2004	8,296	11,349	4,500	12,645	18,9	15	-	36,824
2005	9,117	12,275	4,487	12,906	20,1	15	-	38,820
2006	10,197	12,641	4,520	13,063	59,0	23	-	40,502
2007	10,097	12,853	4,322	13,395	146,3	23	-	40,836
2008	10,095	13,428	4,072	13,829	363,7	29.8	-	41,817
2009	10,501	14,555	4,284	14,553	791,6	77.2	-	44,761
2010	11,891	16,112	4,276	15,831	1,320	94.2	-	49,524
2011	12,491	16,003	5,438	17,137	1,729	114.2	-	52,911
2012	12,530	17,162	5,337	19,620	2,261	162.2	-	57,072
2013	12,563	20,255	5,830	22,289	2,760	310.8	-	64,008
2014	14,771	21,476	5,555	23,643	3,630	404.9	40.2	69,520
2015	15,483	21,261	5,159	25,868	4,503	623.9	248.8	73,147
2016	17,316	22,217	4,878	26,681	5,751	820.9	832.5	78,497

Recently, Turkish energy policies and strategies have given the highest priority to increase the share of renewables until 2023 with the target to increase the share of renewable up to 30 percent in total. In specific, the 2023 target with comparison 2013 data is presented in Table 4.7 below (T.C. Enerji ve Tabi Kaynaklar Bakanlığı, 2014). Obviously, the intent is to increase the capacity and production ratio.

Table 4.7 : Turkey installed power capacity and electricity production in comparison with 2013 data and 2023 target (T.C. Enerji ve Tabi Kaynaklar Bakanlığı, 2014, p. 18).

Renewable Energy Technology	Installed Power Capacity (MW)			Electricity Production (GWh)		
	2013	2023	Δ	2013	2023	Δ
Hydraulic	22,289	34,000	53%	59,420	91,800	54%
Wind	2,759	20,000	625%	7,558	50,000	562%
Geothermal	310	1,000	223%	1,264	5,100	274%
Solar	0	5,000	-	0	8,000	-
Biomass	224	1,000	346%	1,171	4,533	287%

Since the last decade, it is witnessed that significant progress has been made in renewable energy agenda in terms of the policy framework. Legal entities and The Renewable Energy Law entered into force in 2005. After 2005, laws and regulations keep growing, that can also be followed from Figure 4.9. (T.C. Enerji ve Tabi Kaynaklar Bakanlığı, 2014). With this perspective, Turkey became an attractive investment point in the renewable energy market (Kaplan, 2015).

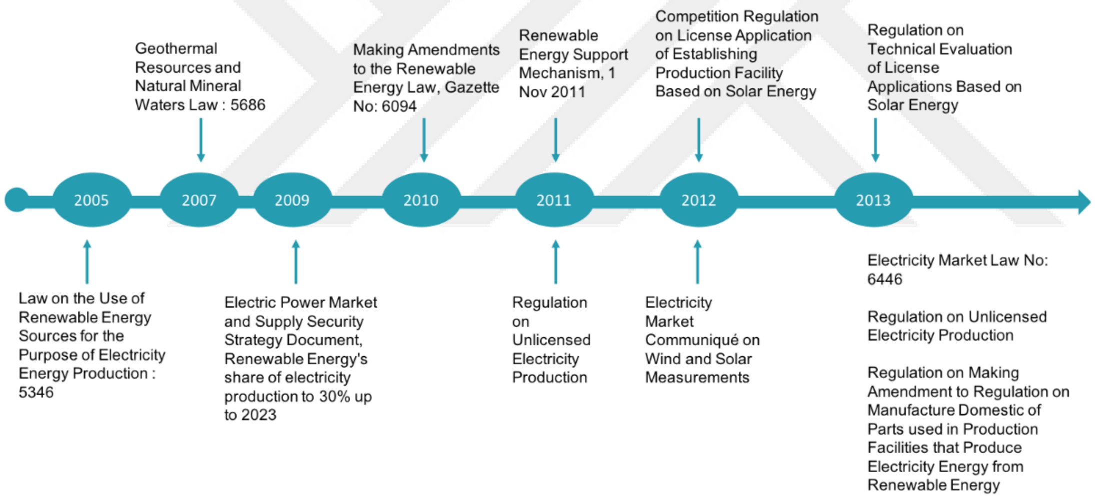


Figure 4.9 : Renewable energy regulations and strategies in Turkey (Kaplan, 2015).

In addition to specific energy policies, renewables became a trending sector and took part in the national development plan. Investing in renewables started to be seen as a brilliant development strategy in the Turkish economic market.

It is observed from the world's trend that solar PV is the most powerful renewable for creating employment. According to IRENA (2015), 2014 data on the employment in renewables approved the statement. As shown in Figure 4.10, the leading sector was introduced as solar power for creating employment opportunity. Then, biofuels and wind power have followed the trend.

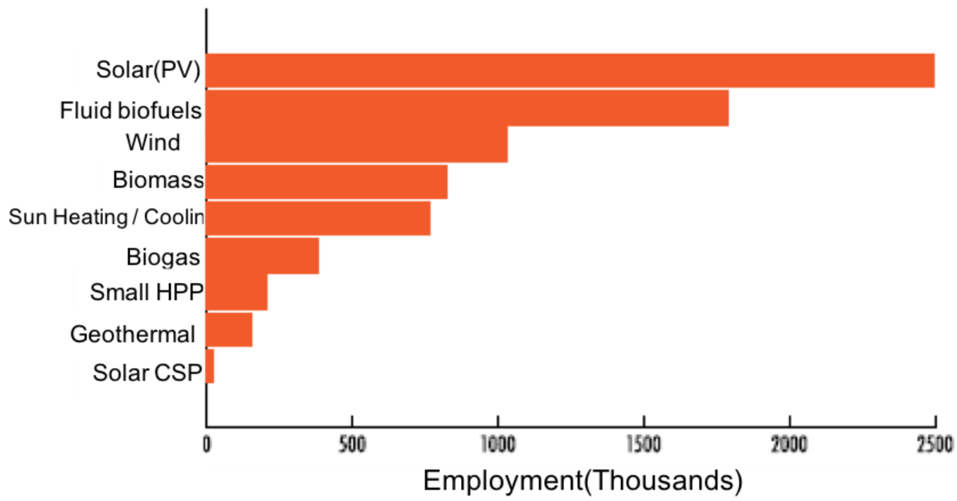


Figure 4.10 : Total employment in renewable energies in 2014 (IRENA, 2015, p.4).

In Turkey, as the 2023 target maintains support for renewables, hydraulic, wind and solar power generation have been remarkable in terms of enhancing the capacity of employment. Thus, in this energy sector, this study depicts the wind and solar power generation as core subsectors to estimate the green jobs potential. Hydraulic is excluded due to the fact that there is an ongoing discussion about whether it is environmentally friendly or not. Wind and solar energy, on the other hand, capture an excellent long-term effect on green employment according to ILO (Renner et al, 2008).

When examining the decent work indicator, the point is that the informal sector data is only available for the electricity sector, but not for the renewable sector likewise other sectors in the analysis. Firstly, informality issue is taken into consideration. According to Social Security Institution, electricity sector covers 35 percent informal employee (URL-29). Although being significantly lower than agriculture, it is still in the top five list. Meanwhile, average weekly working hours in the energy sector is higher than agriculture and is ranked as third in 2016 with approximately 47 hours (TUIK, 2017). In terms of gender inequality, there is a huge difference in the sector. The number of men employee is eight times bigger than women workers (URL-24). Deloitte study conducted by Tek D. and Siyahhan (2018) also proved the argument about women inequality in the energy sector, especially in the renewable energy sector through survey-based approach.

Recent data shows that the installed capacity of the solar power plants is 832.5 MW, and it is aimed at reaching to 5,000 MW by 2023. As being the least harmful alternative energy, wind power plants operating in Turkey created 5,751.3 MW at the end of 2016, and it is targeted reaching at 20,000 MW, although the potential of Turkey is estimated as 48,000 MW in total (TETAŞ, 2016; T.C. Enerji ve Tabi Kaynaklar Bakanlığı, 2014).

There are many approaches to estimate the employment effect. Employment factor approach is one of the ways to be applied in the studies to measure how many jobs can be created. Also, the measurement factor can be changed according to the type of jobs. For instance, construction activities have a different value and maintenance activities of power plants have a separate value. Some studies focus on total constant value, some of them goes deeper and divide direct, indirect and induced jobs by using a different constant. Also, the value of the factor can be ranged from the country to country.

According to Green Jobs Report published by ILO, average employment over the life of facility per MW was stated to predict the number of jobs, based on Rutovitz and Harris studies. Year based job value included the ratio of installation, construction part as well as operation and maintenance services.

In Table 4.8, the employment factor that is used in the process and the operation of a renewable energy system that considers the type of job division take place (Renner et al, 2008).

Table 4.8 : Jobs per MW of renewable power plants (Renner et al, 2008, p.102).

	Average Employment over Life of Facility (Jobs per megawatt of average capacity)		
	Manufacturing, Construction, Installation	Operations & Maintenance/ Fuel Processing	Total
Solar PV	5.76–6.21	1.20–4.80	6.96–11.01
Wind power	0.43–2.51	0.27	0.70–2.78
Biomass	0.40	0.38–2.44	0.78–2.84
Coal-fired	0.27	0.74	1.01
Natural gas-fired	0.25	0.70	0.95

For Turkey, there isn’t any accepted employment factors. Thus, Yılmaz Arlı (2014) comprised OECD countries’ factor table produced by Rutovitz and Harris and created employment factor through regional employment factors with regard to reduction ratio in three categories for Turkey: manufacturing, construction and installation, operation and maintenance, as it is also shown in Table 4. 9. Because of this study focus on wind and solar, related factors are taken from Yılmaz's study. However, Yılmaz Arlı expressed that the factors are not reliable.

Table 4.9 : Employment factor in renewable energy for Turkey (Yılmaz Arlı, 2014, p. 124).

	Manufacturing	Construction and Installation	Operation and Maintenance
	Job-Year/MW		Job/MW
Solar	14.31	19.28	0.53
Wind	12.65	4.38	0.36

In a further step, Yılmaz Arlı (2014) conducted a survey to strengthen the analysis and at the end, she proceeded in three scenarios to estimate overall green jobs. Scenarios were constituted with fixed rate-based, trend-based and 2023 target-based, including two different local production scenarios as active and passive. In solar power with 2023 target scenario, it is estimated that 7,891 jobs created with active local production. In wind power, the same scenario presented 27,209 jobs.

Deloitte and Elia Grid International (2016) investigated Turkish wind power sector and highlighted the importance of wind energy for economic and social aspects within the support of TUREB. The outline of the report based on the scenario for the possible contribution of 1000 MW wind power to the Turkish economy each year. In their methodology, the calculation was based on per MW effect. They estimated that 4,7 GW capacity of installed wind power might contribute 1.7-1.9 billion USD to GDP. They also examined the countries' experiences on employment effects of wind power. It is learned that with the capacity increase, the employment factor decreases. In Belgium, the capacity was 376 MW and the employment factor was 11.7 in 2008. In 2010, the capacity rose to 886 MW and the employment factor decreased to 6.9. It was declared that when the capacity will reach about 10 thousand MW in 2030, the employment factor is expected to be 1.4. In addition, they presented that the employment factor is different from country to country. They estimated that Turkey's employment factor was around 2.7 – 3.4 due to low local production level. Thus, the 2015 employment contribution predicted as 12 - 15 thousand people.

Recent records show that there are 53,000 people employed in wind power and 16,600 people in solar heating and cooling, and 12,700 in PV in Turkey. It can be expressed that in total number of employees in wind and solar energy is 94,400 which are equal to 3.4 percent of the total energy sector (IRENA, 2017).

Considering 2023 target, wind power is expected to grow up to 20,000 MW, which is about 5,751 MW, based on 2016 calculation. To estimate the expansion of the employment number between 2016 and 2023, the employment factor produced by Yılmaz Arlı's study regarding local factors is taken into consideration. The difference between targeted MW and current MW is assumed as the gained MW through new constructions. Thus, construction, manufacturing, operation processes are included and total employment factor is used. Basically, with the application of the total factor (12.65+4.38+0.36=17.34) to expand production capacity (20,000), the result shows that approximately 294,000 (20,000*17.34 – 53,000) jobs can be created in the wind sector by 2023.

In solar energy, it is expected that solar capacity will reach to 5,000 MW by 2023. Similar to wind energy capacity estimation process, the comparison between the current state, which is 2016, the targeted capacity is found. Then, the total employment factor (14.31+19.28+0.53=34.12) produced by Yılmaz Arlı is applied. Multiplying the employment factor (34.12) to the expansion capacity (5,000) shows that, Turkey can create approximately 142,000 (5,000*34.12 – (12,700+16,600)) additional job opportunity in the solar energy systems until 2023. The employment in the solar energy is lower than the employment in wind energy because of the insignificant target of MW number. Within the framework of 2023 target and considering local employment factors, wind and solar energy systems offer a quite high level of job opportunities.

4.3.4.3 Construction

Globally, the building sector consumes nearly one-third of the total energy consumption according to 2014 data collected by IEA (URL-31). Due to the rapid population growth, the demand for the construction market will continue. If the same construction activities will continue without caring about environmental aspects, energy demand caused by building sector is expected to reach 50 percent until 2050. This growth can be seen more in developing countries (OECD/IEA, 2017). In this point, greening the building sector has a significant role in terms of achieving environmental goals as well as providing economic and social benefits (URL-32).

Green buildings require specialized design and material to eliminate environmental impacts and to conserve energy as well as water, pollution and other resources (Liming, 2011). It is acknowledged that the countries applied the green building activities have recorded noticeable gains in terms of energy, carbon and water saving. For instance, in Australia, green buildings in the Green Star certification presented 62 percent fewer GHG and 51 percent less water usage than average buildings (URL-32).

Moreover, creating green jobs is another positive impact of the green building sector. However, the workforce has been facing some barriers. The construction process of these buildings is in need of skilled workers such as architects, carpenters with new green design knowledge and techniques (Liming, 2011). Due to the fact that the different countries have different environmental ecosystems and cultures, the techniques for greening buildings are different as well (URL-32). Thus, nations develop their own certification systems that serve as a guide for the transition to green buildings. LEED from the United States and BREEAM from Great Britain are the most recognized certificate systems that are valid for Turkey as well. They are accurate proof that the building is green in terms of comprehensive environmental indicators. Thus, green buildings under the certification can be counted as environmentally friendly.

In Turkey, the share of the construction sector is nearly 9 percent whereas the global level holds 15 percent in 2017. Following the growth path, employment in the sector has been steadily increasing, exceeding over 2 million people by 2017. The recorded building licenses and permits are given by municipalities show that the demand for housing is steadily growing (KPMG, 2018).

In recent years, Turkey’s construction sector related legal framework supported to promote green buildings since 2007 with the Energy Efficiency Law, the Regulation of Energy Resources and Increasing Efficiency in Energy Use, the Regulation of Thermal Installation in Buildings, the Regulation of Excavation, the Construction and Demolition Waste Control and the Regulations of Energy Performance. However, in 2015, the most significant improvement has been done. On December 8, 2014, the Regulation of Licensing the Sustainable Green Buildings and Sustainable Settlements entered into force prepared by Ministry of Environment and Urbanization (Gültekin and Bulut, 2015). Recently this regulation was announced to add new improvements in 2017. In these adjustments, Green Certificate, Green Building Commission, Green

Building Logo terminologies were announced for the first time (URL-33). All legal support expresses that the awareness of the need for green building has also risen.

In practice, a local green building certification system has been tried to develop by institutions, organizations, NGOs, and universities. Sustainable Energy Efficient Building (SEEB-TR) was announced in 2014 by Mimar Sinan University. In 2013, Safety Green Building Certificate developed by Turkish Standards Institution. Also, a Green Building Certificate was announced by a well-known NGO named as ÇEDBİK that works on green buildings and related training. However, studies emphasized that there is a need for a publicly supported local certificate system to avoid complications (Gültekin and Bulut, 2015).

In addition to the legal framework, national strategic and development plans mentioned about their targets on reaching 20 percentage saving in the building sector until 2023. The 2023 goals of Turkey include ambitious targets for transforming at least one-fourth of all building stock into the sustainable building (Çamlıbel and Alhanlıoğlu, 2012).

When examining decent work criteria of the construction sector, the informal employment is quite high, with the rate 36 percent comparing to the other sectors (URL-29). The average weekly working hours were recorded as the highest rate with 49 percent according to TURKSTAT (TUIK, 2017). Also, the building sector was suffering from gender inequality when comparing the number of the men and women employees. With these indicators, it can be said that the sector is far from to be decent.

Similar to global, greening the building sector is supported in Turkey through both legal and strategic plan frameworks. That's why, green building is a core area for estimating green jobs potential. However, green building has not a separated workforce category, thus direct employment ratio or other workforce indicators do not exist in the national statistic institutions.

In the estimation stage, studies show the effect of green buildings on employment through investment-to-job approach. The approach can be applied in retrofitting activities or new building construction activities with green certification systems. There are good examples that show how retrofitting project contributes to the employment rates. The best known retrofitting project was initiated by Germany and it is declared that for every $1.4 billion (€1 billion) invested in the program, 25,000 additional jobs are expected. The European Trade Union Confederation reported that it would cost $4,300 billion (€3,145 billion) to retrofit the EU's residential buildings and it corresponds to 1.4 million full-time jobs. The Canadian government estimated that implementing a retrofitting program on a national scale would result in 5,600–7,840 people per year that represents 20 jobs for every $1 million invested, or 1 job for every $50,000 (Renner et al, 2008a). In South Africa that had 400 billion ZAR investment project through new and retrofitted building stock, it is estimated that for every 1 million invested in building, 4.26 jobs are created directly in the building industry (Keivani et al, 2010).

In Turkey, there are 304 ÇEDBİK certificated, 264 LEED certificated and 40 BREEAM certificated projects in 2017 (URL-34). There is no data showing the number of building stock in Turkey, except the registered ones. It is known that there are many buildings without any registration or permit in Turkey. Thus, it is impossible to estimate the potential of retrofitting capacity. However, together with the 2023 goals of Turkey, the investment strategy with the urban transformation was also announced. In this study, the estimation of green jobs is done through the assumption of all investment that goes for new green building construction.

Çamlıbel and Alhanlıoğlu (2012) made some calculations based on assumptions about how many buildings can get the local green certificate until 2023. According to GYODER report, 7,560,000 building is expected to be constructed between 2012 and 2023, based on the housing needs. Based on other countries experiences, investing $1.4 billion will averagely create 25,000 jobs. Basic correlation in the investment amount of Turkey indicates that approximately 7,143,000 (400,000*25,000 /1.4) direct full-time job opportunities can be created by the green building sector up to 2023.

4.3.4.4 Transportation

Globally, the transport sector related GHG emissions continue to grow. According to a recently released report of IEA, the transport share of global energy-related CO_2 emissions covers 23 percentage of total emission. Especially road transport is responsible for a large proportion of the emission which is accounted as 72 percent (OECD/IEA, 2017).

The transport sector is very resource intensive as well as it is considered as the driver of modern economies. Thus, the sector is generally prioritized to reduce own environmental impact through investments. Global trend attempts to try to figure out different methods to create a sustainable transport system in cities. Some solutions are suggested as enhancing public transport network, discourage private car usage, promoting cleaner fuels or electric vehicles to reduce CO_2 levels (Renner et al, 2008a). These initiatives can be supported by public or private companies.

It is always stated that sustainability in the transportation sector requires a transition to an efficient and affordable public transportation system. Recently, cities attempt to establish efficient or free public transportation systems, including a prohibition of private cars in the inner-city mobility. In addition, system design through technology such as electrification is emerging. The new global agenda supports smarter public transportation to reduce environmental impacts, and at the same time, these smart design systems are in need of skilled workers.

The number of the vehicle is expanding as the urban population grows in Turkey. Between 2015 and 2016 the light vehicle ownership has increased by 6.5 percentage and reached to 15.2 million vehicles. Turkey has 6 cities that have congestion problem with higher than 25 percentage congestion level. Istanbul is the main city with the highest rank of 49 percentage congestion level in Turkey and spotted as the 6th most congested city around the world. İstanbul is followed by Ankara, Izmir, Bursa, Adana and Mersin in Turkey (TOMTOM, 2016). In Turkey, the mainstream public transportation vehicles are bus, minibus, taxi, paratransit systems named as dolmus (collective taxi) and Metrobus (with a separate BRT line on the highway) for road transportation; metro for railway systems; boats for seaway vehicles. Public transportation is under the responsibility of municipalities according to the 5393 numbered Municipality Law and 5216 numbered Metropolitan Municipality Law.

After screening the legal and strategic framework of the Turkish transportation sector, the aspiration that combines the environmental concerns and public transport network is observed. In the Tenth National Plan, it was stated that the public transportation systems are promoted with the integration of pedestrian and bicycle roads and smart mobility solutions. Also, other transport modes such as metro, light rail, tramways are expected to grow in terms of fleet and capacity of passengers. The other strategic sectorial plans and action plans supported human-oriented transportation and at the same time, decreasing the GHG emissions (Cirit, 2014).

Turkey aims to create a sustainable transportation system, which provides safe, accessible, comfortable, environmentally sensitive services and contributes to the increment of the quality of life. Within this framework, it is targeted to increase the share of railways up to 15 percent in cargo transportation, 10 percent in passenger transportation, decrease the share of highways below 60 percent in cargo transportation, 72 percent in passenger transportation as of 2023 and also control the emissions caused by the use of private vehicles in urban transportation (T.C. Ulaştıma, Denizcilik ve Haberleşme Bakanlığı, n.d)

Thus, subsectors related to promotion of public transport integration are assumed as environmentally friendly sectors for Turkey, according to ILO's studies.

Due to the fact that the public transport is not an accepted subsector, there is no specific data for the public transportation sector. Decent work criteria of the transportation sector present that, informal employment in the sector is very low compared to other sectors mentioned in the study, and stated as 36 percent (URL-29). The average weekly working hours is high like in the energy sector with 48 hours (TUIK, 2017). The ratio of gender inequality is quite high like in the construction sector.

The transportation sector has an important role in creating jobs. Investment in transport infrastructure including light rail and tram tracks, bus lanes, stations, platforms, bike paths, and traffic signals create job opportunities, especially for construction and maintenance part. Although comprehensive global employment statistics are lacking, public transportation has a large amount of employment. In the United States, transit agencies employed nearly 367,000 people in 2005. According to the International Association of Public Transport (UITP), 900,000 employees are estimated in urban public transport in the EU. UITP has 2,900 members around 90 countries. National statistics from these countries announced that the number of direct jobs in public transport corresponds to 1–2 percentage of total employment (Renner et al, 2008a).

The Austrian Action Program for Mobility Management klima:aktiv has been launched to promote environmentally sustainable mobility through environmentally friendly vehicles, alternative fuels, energy efficient mobility management, eco-driving, cycling and public transport while stimulating green jobs at the same time. After five years, it supported over 1,800 businesses and created 3,000 green jobs with the total financial support of €271 million ($316 million). Besides, 450,000 tons of CO_2 reduction was recorded. In addition, Austria released Master Plan for Green Jobs in combination with the program to create new green and healthy job profiles including training, certification of eco-driving trainers and e-bike technology. The “Masterplan for Green Jobs” expects that around 15,000 green jobs to be created by expanding public transport, electric mobility, and cycling. Currently, already 200,000 Austrians work in the economically vital and growing environmental sector. The goal is to create 100,000 additional green jobs by 2020 (WHO, 2011).

In Copenhagen, cycling infrastructure investments generate benefits for many citizens and businesses. The municipality has used factors including safety, comfort, transport time, tourism and branding to calculate the benefits of cycling. Combining all the factors, the council estimated that transferring one road user from car to bicycle avoided €0.1 of external cost per km during off-peak hours and created €0.16 of external benefits. The creation of infrastructure may support more indirect and induced jobs. A study estimated that for every US$ 1 million spent on bike lanes, 14.4 direct and indirect jobs were created and 11.3 jobs are created for every US$ 1 million spent on pedestrian projects, compared with only 6.8 jobs on road resurfacing (WHO, 2011).

In Turkey, the information related to the number of employee in the public transportation network is not available. There is only a sectorial employee number which is comprised of logistics and storage together and it was recorded as 1,235 thousand people. Thus, regarding 2023 target, the investment of transportation sector is announced as $250 billion. The Austrian case employment factor is applied to figure out the potential addible of green jobs. In Austrian case, it was stated that $316 million crated 3000 jobs at first. With basic correlation, Turkey will develop a transportation network with $250 billion and this amount of investment is assumed to use in the generation of the public transport system. All amount of money can be used to estimate for creating jobs. Thus, it is expected that the investment can serve to create job possibilities as approximately 2,374,000 (250,000*3,000 /316) people until 2023.

4.4 Overall Assessment of Turkey’s Green Job Potential

For Turkey’s economic structure, it can be expressed that Turkey is under the average of OECD countries in terms of the basic economic indicators. Regarding the sustainability indicators, Turkey is lucky because of being a developing country. There are many opportunities to develop a green economy and draw a successful road towards sustainability.

For the estimation of Turkey's potential for green jobs, five tasks were followed that is created by ILO. However, it is modified because of the data limitation, and the methodology of ILO has been adopted that is applied in different countries having struggles with data limitation. The tasks lead the study to make a preliminary analysis of the country. Five tasks are constituted by giving information about the green outlook of Turkey, employment structure, legal and strategic framework, environmentally friendly core sectors and decent work criteria indicators. The final part is closed by estimating the potential amount of green jobs. The modified tasks used in the methodology are presented in Table 4.10.

Table 4.10 : Five tasks for the methodology of this study based on ILO methodology (Prepared by the author).

Task	Description	Output	Answers
Task1	Understanding the overall structure of the domestic economy and total employment	Overview of the economic structure	Nearly under the OECD average in the economic, sustainable and job quality indicators
Task2	Developing screening criteria that support 'core' environment related works and decent work	Propose core sectors via screening criteria	Agriculture, energy, transportation, and construction sectors are selected
Task3	Identifying economic activities that support "core" environment-related employment	Define economic activities and estimates of green jobs	Organic farming, wind, and solar energy, green building, public transport are detected
Task4	Screening "core" jobs using decent work criteria	Review core sectors with decent work criteria	Assume all environmental friendly activities are decent due to lack of data
Task5	Analyzing green jobs	Summarizing potential capacity of green jobs	With ambitious scenario and assumptions, selected activities have the potential to create approximately 10,000,000 jobs

The green outlook of Turkey shows that measures in Turkey are in a good state. However, the way of development or the approach used in the strategies is important. Structuring green and sustainable development is not an easy task, especially for developing countries like Turkey.

Screening Turkey's employment profile, there is a risk of growth in the unemployment rate. The rate of employment is quite lower than in OECD countries. Besides, the working environment is problematic in terms of meeting basic human rights and needs such as work-life balance, education level, jobs strain and gender equality.

But on the other hand, the legal framework of Turkey is in an inspirational progress. There are many attempts related to sustainability. However, the most important step is to carry on implementing the legal framework into practices. The notion of sustainability has taken place in the national development and strategic plans for a long time. However, green economy and green jobs subject is a relatively new concept to be considered in the plans and targets.

When considering sectorial dynamics with regard to legal and policy frameworks, with the assistance from ILO's studies and experiences from other countries, the potential in the agriculture, energy, building, and transport sectors are estimated. Sectors are examined further to figure out the core areas which are compatible with environmentally friendly sectors. Combining subsectors that are presented under the categorization of long-term green jobs potential of ILO, global trend and Turkey's targets, lead the study to identify environmentally friendly core sectors. Organic agriculture, wind and solar energy, green building and public transport are presented as core environmentally friendly sectors for Turkey.

In fact, selected environmental-friendly sub sectors require an assessment with decent work criteria. There is no detailed data in selected areas, thus main sectors are examined with decent work criteria. The content of decent work criteria is determined as the informal economy, average weekly working hours, gender inequality and a number of registered employee in labor union that all depends on available data. All related results of decent work indicators can be seen in Table 4.11.

Table 4.11 : Decent work criteria of sectors (Prepared by the author)

Sector	Informal Employment (Social Security)	Average weekly working hours	Gender Inequality (Number of men/women employee*)	Labor Union (2018 march)
Agriculture	82%	38.8	M: 2920 W:2384	91,689
Energy	34%	48.2	M:229 W:28	91,828
Building	36%	49.4	M:1904 W:83	82,139
Transport	23%	47.9	M: 1073 W:112	95,332

*thousand people M: Men W: Women

In terms of decent work criteria, Turkey's portrait does not seem very good. Even though examination is applied all kind of economic activities which are not environment-friendly, protecting workers right and caring human needs in the working environment is very critical issue for being productive in the production process. This study is assumed that selected subsectors meet both environmental-friendly and decent work criteria, thus they are counted as green jobs.

In the estimation part of the study, subsectors have analyzed in detail by available data such as the number of employees and presented strategic goals. Estimating potential of green jobs is pursued by employment factors and investment-to-job approach. Then, the basic linear correlation based on optimistic assumptions is applied. A potential number of green jobs is presented. The result that shows the number of opportunity in creating green jobs considering the optimistic scenario and limited data is comprised in Table 4.12.

Table 4.12 : Potential green jobs by 2023 (Prepared by author)

Sector	Year interval	Estimation Approach	Potential Addible Number of Green Employee
Organic Agriculture	2016-2023	Employment factor	50,000
Wind energy	2016-2023	Employment factor	294,000
Solar energy	2016-2023	Employment factor	142,000
Green Building	2013-2023	Investment-to-job factor	7,143,000
Public Transport	2013-2023	Investment-to-job factor	2,374,000

It is a fact that the result is not reliable because of an optimistic assumption. However, making an assumption is applied to show the capacity to be used for developing strategic decisions. Green building sector expresses huge potential than others. Scanning Turkey's development path, it is not a surprise result because of the sector attracts many investors due to serving large amount profit. After that, public transport is another sector that can provide many green jobs. Solar energy seems to have the lowest ratio in the green employment, but it should be acknowledged that the target capacity is also very low comparing to the others sectors.

5. CONCLUSION

There is increasingly growing interest among academics, international institutions and governments in green jobs due to the green economy transition activities. It is believed that creating green jobs provides an advantage in the transition process from the traditional to low carbon production pattern as well as maintains the whole energy-efficient system. Indeed, the creation of green job is seen as related to very special policies that almost every country attempt to apply for solving unemployment and taking action to urgent calls about shifting low carbon, zero-emission or green economy because of climate change effects.

The notion of green jobs is developed regarding the sustainable development concept to ensure sustainable economic development. Green economy and green growth focused on environment-related activities to minimize effects while emphasizing the needs for social quality. While many policymakers and leaders want to deliver successful portrait in the sustainable and green economy, the need for focusing on the workforce has emerged. The workforce requires deeper studies for promoting green jobs. Promoting green jobs is seen as the way of accelerating the green economy transition.

In 2015, through new commitment on Sustainable Development Goals, which was set up as 2030 agenda to reach targets, provide new goals for decent works and economic development as well as protect environmental aspects and human rights. In this point, green jobs development policies compile attention to serve as a contribution to almost every target.

Although there is no widely accepted definition of green jobs, a leading international actor, ILO, introduced the concept and has applied many studies. ILO announced that green jobs minimize the environmental effects and they need to be environmentally-friendly as well as decent. It is the comprehensive definition of green jobs which emphasize the requirement of meeting both criteria of being environmentally-friendly and decent work.

It can be expressed that, many developing countries have progressed for integrating the notion of green jobs into the political and strategic frameworks, and creating green jobs through green economic activities. Developed countries present the best examples and indicate positive results. Different country practices demonstrate that green jobs can be provided in any sector. However, some sectors are defined as key driver sectors and core areas for creating direct green employment in short term. As an answer to one of the research questions of this study, deeply scanning the best cases and studies show that key sectors of green jobs can be aligned as renewable energy, organic farming, green building, recycling, green technology that require investments, green stimulus packages, and well-structured strategic frameworks. In this point, the United States, China, and Germany present a developed structure in the green jobs development.

Turkey portrays an honorable path in transition to green economy and pushes the boundaries to keep deliver sustainable development in every sector, although green vision is a very new concept. Turkey accelerates energy efficiency activities especially through regulations and supports energy, building, transport, recycling, and industry sectors. After screening the strategic legal policy framework, it can be expressed that Turkey's greening path has started and environmental concerns started to take place in every strategic and development plan. While economic growth aspiration on demand, preventing environment is prioritized. Sustainability goal of sectorial strategic and national development serves as a potential that leads to green jobs development. The notion of green jobs does not take part in the national development plan directly because there is no widely accepted green definition in the country. However, it can be said that sectorial strategic and action plans promote the concept indirectly. All investigation attempts through the legal framework of Turkey show that Turkey's current level in terms of national and local legal framework has been progressing which is another research question of this study.

Turkey is a developing country with the rapid growth of population and economy. The green outlook of Turkey that is defined with sustainable indicators demonstrates that further push is required for achieving green development. The employment outlook seems progressive with over half rate, although it is under the average of OECD countries. Despite the fact that the legal and policy framework of Turkey attempt to develop the green economy with ambitious targets, it is hard to define environmentally-friendly economic activities in practice. On the other hand, the quality of the job environment is controversial in terms of gender equality, working hours, wage inequality and work-life balance. At this point, it is hard to mention about being decent for the Turkish employment environment. This situation explains that the employment structure of Turkey does not meet the requirement for green jobs.

In this thesis, revealing the potential in terms of green jobs in Turkey is the main issue that has been searched. The estimation of targeted green jobs and green jobs in practice is a lack in Turkey's framework. The literature in Turkey does not grow mature in terms of green jobs studies yet, but there are a few studies focusing on Turkey. However, none of them consider about the creation of green jobs in number, except the one that is produced by the national government as the thesis of expertise. Thus, the motivation of this study is to fulfill the gap in Turkey's literature emphasizing the green jobs notion and creation of green jobs potential.

After scanning all the literature to understand the development of concept and experiences, a deeper examination is made to figure out the ways of calculation. The leading actor, ILO, has developed the comprehensive method. Although there are another attempts to find the potential of green jobs, the five tasks of ILO methodology are applied to shed light on the research questions. However, the availability of data to use for analysis is the hardest part of the study. On the other hand, collecting national data requires national level attempts. Thus, five tasks are adjusted for limited data, similar to implementations of ILO for developing countries. From the perspectives of tasks, steps include further analysis of economic activities and deciding key driver sectors which are compatible with the dynamics of Turkey.

Screening details about Turkey, including national development and sectoral strategic plans, lead to the decision of the key sectors for creating green jobs as agriculture, energy, construction, and transport. Deeper investigation of sectorial outlook serves as the opportunity to figure out the core environmentally-friendly subsectors. Organic farming, wind, and solar energy, green building, public transport are examined as core environmentally-friendly areas for supplying green jobs

To decide which environmentally-friendly sub-sectors are green jobs, decent work criterion is applied. However, there is no data to point out the level of selected sub-sectors in terms of decent work. Main core sectors are explored with decent work criteria, but it is obvious that the result does not reflect the accurate portrait. Thus, selected environmentally-friendly subsectors are assumed as they fit green jobs requirements.

To figure out the potential, Turkey’s 2023 vision is considered as the target year. Two different estimation approaches are applied because of data limitation. In this point, constant values are produced by other studies and other countries’ experiences. The main issue that causes the unreliability of results is not using local factors and constants. Organic farming and wind and solar energy potentials are assessed with employment factor within the 2016-2023 period, meanwhile green buildings and public transport potential estimations based on investment-to-job constant within the 2013-2023 period.

Turkey’s sectorial priority is observed mainly in the construction sector with a large amount of investment. Thus, if Turkey decides to construct all urban transformation project regarding green building, it would create a significant green jobs opportunity. After that, investment to public transport network presents the notable ratio of serving potential green jobs. Thirdly, energy sector presents major importance for creating green jobs. However, wind and solar energy targets are quite lower than other sectors considering Turkey’s potential. The potential of organic farming ranks at last in terms of creating green jobs. Total potential of green jobs is presented as approximately 10,000,000 within ambitious assumptions.

To focus on what has been learned from the study, the concept of green jobs for Turkey’s framework is not out of way. Turkey presents attention to green vision, energy efficiency and sustainable development. Considering all aspects, more actions and attempts are needed as well as strengthening the local legal framework is required. Turkey has baby steps in developing a legal framework for the green economy and green jobs. Investigation of the Turkish market indicates that private companies have already internalized the notion. Turkey’s next step should aim to comprise the interaction between actors and to enhance know-how in order to bring nation-wide accepted definition and content for green jobs. After many interactions of stakeholders and linking them regarding green market analysis, all studies should canalize to create the needed comprehensive vision about green jobs development for Turkey. After national level studies, sector-level analysis and similar studies should be realized. Besides, top-down and bottom-up strategies should proceed together.

Besides to legal framework development, investments should have considered enhancing progress, for instance, investments in green research and design, green technologies lead to gain profit in both economic and social. The aspiration of green jobs cares about social wealth as well as protecting the environment. Thus, investment areas and strategies should consist of the specific area. In addition, nations or banks should provide green stimulus packages to support the market and accelerate the development.

Likewise in many studies, this study also observed that the data availability and the lack of data collection at the national and local institutions are the main constraints. Measurement is a key and initial step to create the whole roadmap because it is essential to know the current situation. From this perspective, nation-wide studies should aim to make an inventory or create a database for employment activities and related data for green jobs and decent work indicators.

From the workforce perspective, it can be said that the profile of labor in Turkey suffers from many problems like unemployment and getting social rights. The working population ratio seems quite high, but the quality and quantity of employment are considering when comparing the ratio with other countries. To create a successful green vision and green jobs development roadmap, the current situation of the workforce should be analyzed. Eliminating drawbacks and creating social welfare should be first steps. To prepare the labor market for further development and technology is essential to create a powerful roadmap. The notion of green jobs introduces the subject of green skills in order to facilitate and to enhance the workforce. Training and educational programs about getting related skills that employee’s need should be considered in the framework of strategic plans. Powerful training and educational programs will surely lead to a more productive workforce that is very essential to deliver green development.

All in all, green jobs notion is not a scary scenario for employment and economic development, rather green jobs leverage the green vision and facilitate a more productive and competitive market around the world, but within the right framework in terms of legal and strategic policies.

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