D7.1 First impact assessment report

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Executive Summary

This document constitutes Deliverable D7.1 'First impact assessment report' in the framework of the project titled 'Revealing fair and actionable knowledge from data to support women's inclusion in transport systems.' (Project Acronym: DIAMOND; Grant Agreement No 824326). Transport can make a big difference in increasing women's productivity and promoting social equity[1]. It has been established that women trade more time for activity participation than their male counterparts; these activities are spread geographically in space requiring a form of transport to move between these spaces. Having an efficient transport system can make a big difference not only in facilitating movement between activity centres but also reducing the time budget and consequently increasing women's productivity and promoting social equity. The general aim of this project is to propose a set of actions to adequately respond to the needs of women in transport.

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[1] http://www1.worldbank.org/prem/PREMNotes/premnote14.pdf

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This task 7.1, provides a report of the methodology for identification and quantification of the potential benefits from applying the set of actions proposed by the DIAMOND project (outputs in terms of results and a toolbox) for each of the different stakeholders' groups. In order to derive comprehensive information about the potential effects of the DIAMOND project, having in mind its specific purpose, an integrated approach is required. By integration, it is proposed that the various dimensions should be addressed within the impact assessment methodology, in a way that recognises the linkages and inter-relationships between them.

The main objective of this deliverable is to investigate the effectiveness, efficiency and equitability of the proposed innovations from DIAMOND's analysis as well as the relationship between the proposed measures. The deliverable will provide evidence in support of the benefits of the fairness measures to the transport system as a whole while outlining the direct impact of implementing the identified fairness measures to the businesses of the main stakeholders, corporate image and social equity. For each use-case, the effects of increasing fairness levels will be determined based on the knowledge gained from interdisciplinary analysis and taking into account the outputs from WP2 (fairness and use-cases definition, performance indicators) and WP6 (testing and validation of the toolbox). In the essence of the methodology is a cross-dimensional approach for a more rounded assessment of the performance of a more gender-responsive transport system. \

The approach is based on assessing the impact in three dimensions: Efficiency, Effectiveness and Equity. For each of these dimensions, the set of performance indicators for each use case will be selected and measured. The general aim would be to reach a higher level of efficiency, while at the same time being able to meet quality and equity criteria. The outputs from this task will serve to build the impact reports in the next task. Estimations of the effects of proposed measures will be assessed since it will not be possible to implement the fairness measures and assess their effects within the timeframe of the DIAMOND project.

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Terminology and Acronyms

3E	*Efficiency, effectiveness, equity*
PI	Polyhedral Individual
UC	*Use Case*
DEA	Data Envelopment Analysis
DMU	*Decision Making Unit*
PES	Payments for Ecosystem Services
REDD+	*Reducing Emissions from Deforestation and forest Degradation*
VTTS	Value of Travel Time Saving
OR	*Operations Research*
KPI	Key Performance Indicators
HR	*Human Resources*
CSR	Corporate Social Responsibility

1 Scope of the document

In order to derive comprehensive information about the potential effects of the DIAMOND project, having in mind its specific purpose, it is needed to apply an integrated approach. By integration, it is assumed that the various dimensions should be addressed within the impact assessment methodology, in a way that recognizes the linkages and inter-relationships between them. The main research question is whether the innovations proposed in DIAMOND are effective, efficient and equitable and what is the relationship between them.

Therefore, we apply a cross-dimensional approach for a fuller and more rounded assessment of the performance of a redesigned transport system. The method is based on assessing the potential impact in three dimensions: Efficiency, Effectiveness and Equity. For each of these dimensions, the set of performance indicators for each use case will be selected and estimated. The general aim would be to assess a higher level of efficiency, while at the same time being able to meet quality and equity criteria.

The use of the 3E's framework as an approach to the evaluation of performance, in general, is not new, this approach has been used in several applications both in transport project appraisal and outside of the transportation environment (Martens 2007, 2017; Lairson et al. 1999; Pascual et al. 2010; Assemble-Mvondo et al. 2013).

Equity-efficiency-effectiveness or 3Es approach is a three-dimensional simultaneous planning system for allocating resources for public services provision (Athanassopoulos, 1998). Equity reflects the allocation of resources (e.g., investment) according to the transportation needs of women. While Efficiency seeks to make the minimum possible use of resources to provide the needed services (e.g., women facilities), Effectiveness measures the extent to which the validated fairness measures meet the respective use-case goals of DIAMOND (increase percentage of women as users or employees in transport systems). The scarcity of resources and the difficulty in formulating the objectives of the 3Es approach has made this approach not feasible in all cases, this conflict between efficiency and equity has been the focus of major studies since the introduction of equity into project evaluation procedures (Thomopoulos et al. 2009).

Consequently, a subset of the 3Es has been considered for the allocation of resources in several studies. In most cases making trade-offs between equity and efficiency (Wilson and Gibberd 1990). For instance, Mandell (1991) proposed a two-dimensional model to make trade-offs between equity and effectiveness in allocating resources among public libraries. Mandell's efficiency model was based on the relationship between population and library books' circulation.

Transport equity can be viewed as the distribution of a minimum required level of accessibility based on principles of social justice and fairness (Martens, 2017; Brussel et al., 2019). In terms of DIAMOND, Equity is related to the question "is the initiative achieving specific goals, reaching certain beneficiaries (women as a PI, in this case) or addressing their specific needs". The picture of the distribution model promoted by the DIAMOND initiative will be obtained. Equity will be based on the selected fairness definitions for each different use case and their evolution due to the implementation of recommendations (for example, improvement of disadvantaged women groups' accessibility to essential services and activities, depending on proximity and location, mobility options, financial costs, or for employment, an increase in women applying to job positions).

In order to assess mutual influence (the need for trade-off) between the selected performance indicators, we will perform dimensional and cross-dimensional, respectively.

1.1 Objectives

This deliverable, D7.1 Productive equity analysis, presents a framework for conducting a socio-economic impact analysis of the DIAMOND project. Therefore, the objectives of D7.1:

- To define a three-dimensional framework for impact assessment;
- To evaluate use-cases and to provide the set of indicators for each of the three dimensions: efficiency, effectiveness and equity, respectively;
- To conduct the estimation of the efficiency, effectiveness and equity of proposed measures since it is not possible to implement these measures within the timeframe of DIAMOND project and measure real effects on the field;
- To propose suitable methods for inter-dimensional and cross-dimensional assessment between selected indicators.

Based on this framework, future tasks will explore the consequences of introducing the DIAMOND related measures, and they will be assessed on a broader scale from an individual (user), organisational and societal level. This should provide the support to convince the transport system as a whole, with personalised arguments for each group of stakeholders showing them that implementing the identified measures to increase fairness level has a direct impact on their business results

1.2 Organisation of the deliverable

The deliverable is organised as follows:

- Chapter 1 provides an introduction to this deliverable, T7.1 Productive Equity Analysis
- Impact Assessment;
- Chapter 2 summarizes the results of the literature study and presents the methodology for three-dimensional impact assessment;
- Chapter 3 describes each of the use-cases and lists selected performance indicators for each of the three dimensions, efficiency, effectiveness and equity;

- Chapter 4 contains concluding remarks.

2 Methodology

The essence of the methodology is to provide a framework to answer whether the measures proposed by the DIAMOND project are; i) efficient (how productive are the measures proposed – how much does it cost to produce more inclusive transport systems). ii) effective (do the measures proposed produce the desired outputs, outcomes and gender-related benefits or impact), and iii) equitable (do the measures achievable and specific goals, reaching targeted inclusiveness levels or addressing specific gender-related needs).

The following section reviews related literature to the 3Es approach and provide the details of the proposed methodology.

2.1 Literature review

Until recently, resource allocation, especially for public service delivery, was based on the objectives of maintaining aggregate fiscal discipline (i.e. to prevent overspending), and to allocate and use resources efficiently (technical efficiency) (Golany and Tamir, 1995). The cost-benefit-analysis (CBA) was the widely used method in resource allocation, in which an alternative satisfying the defined objectives with optimum use of resources was selected among the list of competing alternatives (NTNU, 2015). CBA may demonstrate the consequences of specific resource allocation, including the economic profitability of implementing a project or scheme (NTNU, 2015). However, concerns have been raised about the use of only economic-efficiency criteria (the CBA) in the prioritisation of projects. It has been argued that the CBA approach fails to account for social equity in the estimation of benefits and costs (Collier and Zhuang, 2010).

Moreover, subsequent studies argued that public resources allocation should be based on the maximisation of social welfare. This is expressed operationally via the concepts of equity (Golany and Tamir, 1995). The authors further proposed a three-dimensional model involving equity, efficiency and effectiveness 3Es for resource allocation (Golany and Tamir, 1995; Athanassopoulos, 1998, 1995a). Their model is based on Data Envelopment Analysis (DEA) for evaluation of the relative efficiency of Decision Making Units (DMUs) in the public sector. The model extends the original objective of the DEA methodology from measuring efficiency to include evaluation of various aspects of effectiveness and equality considerations. More precisely, the model can address issues of efficiency, effectiveness and equity simultaneously, and explore trade-offs between them. The model is formulated as a linear program that can be solved utilising Dantzig-Wolfe decomposition algorithm (Dantzig and Wolfe, 1960).

2.1.1 Efficiency, Effectiveness and Equity (3Es)

The main goal of DIAMOND is to turn data into actionable knowledge with notions of fairness, in order to progress towards an inclusive and efficient transport system (DIAMOND D2.2). The achievement of the objective of DIAMOND is dependent on the improvement of transport systems in the selected four use-cases (e.g., Public transport and infrastructure, Vehicles with dynamic control, Vehicle (bike) sharing and Employment of women in the rail industry and freight) based on equity-efficiency-effectiveness criteria.

Equity-efficiency-effectiveness or 3Es approach is a three-dimensional simultaneous planning system for allocating resources for public services provision (Athanassopoulos, 1998). Efficiency or production efficiency (PE), is related to cost-effectiveness and measured by the ratio of produced outputs (i.e., service delivery) to required inputs (such as labour, infrastructure, vehicle design, and capital investment) (Chen et al., 2019). Efficiency seeks to make the minimum possible use of resources to cover the demand for services(Athanassopoulos, 1998). For instance, efficiency can be translated into calculations such as the percentage increase in women using a transit service compared to the cost of introducing an innovation to improve the service quality.

Effectiveness measures the extent to which input generates its objectives (Athanassopoulos, 1998); it is related to the question of how well the inputs lead to the outputs. In other words, effectiveness describes the impact of the inputs in achieving a defined goal. More precisely, effectiveness assesses whether an innovation is likely to achieve its stated objectives and how well the objectives are met

(i.e. what percentage increased in public transport ridership is occasioned by the implementation of an innovation). Effectiveness can be translated into indicators on comfort or quality level of a service obtained from a measure.

However, according to Murray and Davis (2001), Efficiency and Effectiveness criteria focus on issues of economic efficiency in which project priorities are determined on the basis of cost-benefit analysis. These two approaches fail to consider service need and equity, such as social justice and fairness. Moreover, there is now a substantial body of literature advocating for the consideration of distribution equity in the evaluation of transportation services (Murray and Davis, 2001). The concepts of equity, justice, and fairness are subject to broad interpretation, which is perhaps why they were not considered in previous evaluation models for transport services appraisal and prioritising projects.

In general terms, equity is related to the allocation of resources according to the needs of people (Athanassopoulos, 1998; Murray and Davis, 2001). The concept also advocates for the equal distribution of resources, benefits, and services among individuals or socially disadvantaged groups (Martens, 2017). Johri and Norheim (2012) explained that equity is about the extent to which interventions reach and benefit disadvantaged groups, such as the poor, or certain ethnicities, or otherwise vulnerable populations. Transport equity can thus be viewed as the distribution of a minimum required level of accessibility based on principles of social justice and fairness (Martens, 2017; Brussel et al., 2019).

The 3Es approach has been used in different planning settings including transport, environment and healthcare. For example, Martens (2007) successfully integrated equity analysis into the cost-benefit analysis tool for transport project appraisal of Isreal (the Nohal Prat). Like most cost-benefit analysis tools, the Nohal Prat is a regular cost-benefit analysis tool which provides a framework for assessing the economic efficiency of a transport project. The Nohal Prat generates a set of key indicators on the economic efficiency of a transport project based on the cost/benefit ratio (C/B ratio), net present value (NPV) and internal rate of return (IRR). Instead of appraising transport projects based on the CBA framework, Martens (2007) proposed a new framework that incorporates equity analysis. Martens argued that rather than focusing on whether or not a project generates more benefits than costs, the focus should instead be on who reaps the benefits from a transport scheme.

Similarly, Reinke (1994) evaluated health programme from the aspect of effectiveness, efficiency and equity and trade-offs among these dimensions. The author analysed the effects of alternative combinations of the 3Es on health and family planning services. Reinke concluded that the combination of efficiency, effectiveness and equity might involve trade-offs between them. For instance, serving hard-to-reach members of a population equitably may require the compromise of efficiency. Table 2.1 presents a summary of similar studies in equity analysis from a different setting.

In line with the discussion above and the studies reported in Table 2.1, the framework for conducting equity-efficiency-effectiveness analysis will be proposed for appraising the social impact of the DIAMOND project based on the final set of fairness characteristics or measures for each use-case.

2.1.2 Social Equity in Transportation

The DIAMOND project defines fair transportation system as a transport system that provides "*fair and equal opportunity for people with a variety of different characteristics to access a safe, secure, effective and efficient transport system that meet their daily needs*". This definition is consistent with the definition found in Martens (2017) which defines fair transportation system as "*a system that provides a sufficient level of accessibility to all under most circumstances*" (Martens, 2017).

Equity in transport and accessibility has been discussed in several dimensions within which equity can be quantified, for example, horizontal equity, vertical equity, social equity etc. (Geurs, Dentinho and Patuelli, 2016). Horizontal equity defines the extent to which individuals within the same social class (such as income, gender, ability, race) are treated similarly. Vertical equity describes the extent to which members of different classes are treated equally. While social equity refers to the distribution of impacts by population segments that differ in abilities and needs, for example, income, age, gender or ability to travel (Geurs, Dentinho and Patuelli, 2016).

Martens (2012) suggested that the social meaning of accessibility or transport as a good should be related to the benefits of transportation, rather than cost. Martens indicated that the distribution of transport as a social good should be guided by the benefits and not cost associated costs and externalities. Therefore, by DIAMOND's definition of fair transport system, social equity or equity in transport would mean that everyone should enjoy a safe, secure, effective and efficient transport system, even if people with special needs require extra resources and subsidies.

Litman (2002) provided practical guidance for evaluating transportation equity. The author concludes that there is no single methodology capable of covering all varieties of transportation equity. The best way is to consider equity concerns and priorities specific for each individual case. Manaugh et al. (2015) take a critical perspective on social equity and how it is incorporated into transportation plans of 18 large North American metropolitan areas. The authors observed that social equity goals and objectives are not translated into clearly defined objectives, and appropriate measures for assessing their achievement are often lacking. Therefore, the set of criteria for more effective integration of social equity in urban transportation plans was proposed, and the usability of Multi-Criteria Decision Making (MCDM) approach for prioritizing the perspectives of various interest groups was emphasized.

According to Di Ciommo and Shiftan (2017), current planning tools for transport infrastructure and services do not sufficiently consider equity considerations and the complexity in identifying the impacts of travel behaviours on society, the environment and equity. The authors found that issues related to equity are not seriously addressed during the assessment and appraisal of transport projects and policies. Instead of using only Cost-Benefit Analysis (CBA) which does not account for equity, a combination of CBA with MCDM in single evaluation framework was proposed (Di Ciommo and Shiftan, 2017). Travel time saving used in the models favour the well-placed in society, replacing this variable in the models will improve the appraisal system in favour of the vulnerable and transport-disadvantaged groups.

Jeekel and Martens (2017) considered equity in transport as primarily concerned with the level of accessibility conferred by the transport-land use system to persons. The authors compared the application of equity in sectors like health care, education and housing with transport. The study found well-established policies on the provision of fair health care, education and housing covering all income groups, however, plans and policies for on fairness in transport systems were almost non-existent.

Lucas et al. (2019) provided a set of different methods to support equitable decision making in transport. The authors explained that Equity analysis should be targeted at the transport-poor who lacks the opportunities to access to needed transportation services and facilities and those whose mobility needs are not met by the available transport services.

For these reasons, DIAMOND proposes to perform equity analysis as part of the cost-benefit analysis (equity-efficiency-effectiveness analysis) at the PI level on the benefits related to the primary goal of DIAMOND; ensuring fair transport system. From the perspective of DIAMOND, the primary purpose of the fairness characteristics or measures is the improvement of women mobility and employment in the transport sector, in other words, accessibility improvements.

The literature review is summarized in following table.

Table 2-1 Summary of literature review

Authors	Year	Application	Main conclusion
3Es based contributions			
Reinke	1994	Health program evaluation	Combining efficiency, effectiveness and equity may involve trade-offs between them => the high cost of equitably serving hard-to-reach members of the population may require efficiency considerations to be compromised.
Golany and Tamir	1995	Resource allocation model	DEA model for measuring/exploring trade-offs between 3Es in public sector.
Lairson	1999	Behavioral healthcare	Efficiency considered as technical and allocative on macro and micro level. Equity considered as substantive and procedural.
Pascual et al.	2010	Payments for ecosystems services	The key factors conditioning the relationship between equity and efficiency in PES schemes. Equity: procedural /distributive. The existence of interdependencies between efficiency and equity effects in designing of PES schemes.
Andrews and Walle	2012	Performances of public services	Efficiency, responsiveness, equity and effectiveness. Econometrics used for evaluation of different management practices from the aspect of four criteria.

Davis et al.	2013	Hospital performances	Ranking comparisons of hospital performances based on a set of selected indicators in each of the 3Es dimensions. CoV used for comparison of correlation between indicators.
Assemble-Mvondo et al.	2013	Land-related investments	Effectiveness: whether the current land rent mechanism is likely to achieve set objectives. Efficiency: transaction costs induced by the attainment of set objectives. Equity: are the benefits shared and costs allocated fairly.
Martin et al.	2014	PES schemes for biodiversity conservation	Inequity might undermine efficiency.
Pasguard et al.	2016	Reducing Emissions from deforestation and forest degradation	3E+ criteria for assessing different REDD proposals. Effectiveness: whether the proposal will reach the goal of emission reductions. Efficiency: the size of costs for implementation of REDD activities. Equity: benefit/cost distribution.
Shen et al.	2017	Interfirm relationships	Contract complexity vs equity and efficiency in interfirm relationships.
Equity based contributions			
Litman et al.	2002	Transport domain	Variety of different equity types and impacts. Requirement for a specific methodology tackling specific equity issues.
Manaugh et al.	2015	Transport domain	Measures for more effective integrating of social equity in urban transportation plans. MCDM approach as a tool for prioritizing the preferences of different social groups.
Di Ciammo and Shiftan, Martens	2012, 2017	Transport domain	Equity as a consideration of transport projects and policies. Combining CBA with MCDM or modifying the inputs for CBA by equity related measures.
Jeekel and Martens	2017	Transport domain	Equity as a principle is more advancing in other fields than in transport.

Lucas (2019)	2019	Transport domain	Equity correlated with accessibility, environment, health and wellbeing.

2.2 Exploring the effectiveness, efficiency and equity (3E's) in the assessment of the impact of more gender-responsive transport system

Findings from the literature review are the following:

- Efficiency, effectiveness and equity are simultaneously evaluated, and cross-dimensional relationship assessed in order to reveal if some dimension undermines any other dimension and possible trade-offs between them.
- Efficiency can be considered as technical and allocative, on different levels (micro/macro level);
- Equity can be considered as substantive and procedural;
- Equity issues require active participation of community and must be tackled on a specific territory, no common general methodology exists.
- Each type of equity requires a specific assessment methodology;
- Econometrics and OR techniques are applied as tools for assessing the inter-dimensional and cross-dimensional relationship between selected indicators;
- Prioritizing of equity objectives and measures can be done by MCDM.

Figure 2-2 summarises the efficiency, effectiveness and equity dimensions, definitions and the concept of 3Es in the context of these dimensions.

Table 2-2 The 3Es, definition and assessment questions

	Definition	Assessment question
Efficiency	Ratio of OUTPUT/INPUT	How well do research inputs lead to research outputs?
Effectiveness	The relationship between inputs and outputs INPUT -> OUTPUT	Do the DIAMOND related actions lead to outputs, outcomes and impact?
Equity	If OUTPUT achieves X (specific goal)	Is the DIAMOND related actions achieving specific goals – inclusive transport system?

Efficiency represents some combination of reduced costs and/or increased benefits to society. Possible options are reducing inputs for the same outputs, obtaining more outputs or improved quality for the same inputs, obtaining proportionally more outputs or improved quality in return for an increase in resources.

In general, potential KPIs within this dimension are (but not limited to):

- Ratio of increase of women workers in off-site transportation jobs and implementation cost of corresponding measures;
- Ratio of increase of the use of public transport by women (number of woman passengers in public transport during peak and off-peak hours, number of trips made in public transport by women) and the cost of implementing corresponding measures;
- Ratio of increase of adaptability of vehicles usability (number of improved bus/train stops, terminal facilities, number of seats in passenger areas, etc.) and the costs of implementation of these measures;
- Increase of the use of new mobility forms by women (bike sharing, MaaS) relative to the cost of implementing corresponding measures;

Three concepts of efficiency exist: technical, productive and allocative. **Technical efficiency** refers to the physical relation between resources (capital and labour) and the outcome. A technically efficient position is achieved when the maximum possible improvement in outcome is obtained from a set of resource inputs. A measure is technically inefficient if the same (or greater) outcome could be produced with less of any type of input. Technical efficiency cannot directly compare alternative measures, where one measure produces the same (or better) outcome with less (or more) of one resource and more of another. Therefore, the concept of **productive efficiency** refers to the maximisation of outcome for a given cost or the minimisation of cost for a given outcome. **Allocative efficiency** concerns spending limited resources in those areas that will maximise public value. More specifically, the concept of allocative efficiency takes into account not only the productive efficiency with which resources are used to produce outcomes but also the efficiency with which these outcomes are distributed among the community.

Effectiveness represents a degree of goal achievement. In general, effectiveness comes before efficiency; the rationale behind this is to achieve the goals stated by the DIAMOND then to reach the desired efficiency level. Effectiveness assesses whether the set of innovation is likely to achieve the set objectives. It expresses the degree of progress towards the set goals – Do we have what we wanted? - The evaluation criterion for output is based on the principle of adopting only the fairness measures relevant to the achievement of the set goals. An effective fairness measure is such a measure whose results must closely match the expected goals. In terms of performance evaluation, we expect a positive answer to the question of whether the impact of the fairness measures are obtained in accordance with the defined objectives. Interventions – fairness measures in this project are expected to increase the inclusiveness of women in the transport sector.

In general, potential KPIs within this dimension are (but not limited to):

- Increase in % customer satisfaction (number of women who are satisfied with new transport service provided) related to the target defined;
- Increase in the number of women on boards and forums related to planning, implementation, monitoring and evaluation of the transport-related projects.
- Increase in the use of bike-sharing services by women;
- Increase in the number of women in all stakeholder and rail/road user consultation groups.

Equity ensures that inputs and outputs, outcomes and impact are aligned to the intended equitable social goals, which in this case include gender-related goals (ethnic equity, religion and socio-

economic equity per the PI individual concept). Equity will be measured for each of the indicators selected for efficiency and effectiveness dimensions. More specifically, for each of the efficiency and effectiveness related KPIs we will consider age, education, ethnic, religion and socio-economic (family structure, economic level) equity indicators (Table 2-3).

Table 2-3 Different profiles of PI

	Profile 1	Profile 2	Profile 3
Age	<25	25-65	>65
Education	Medium school degree	High school degree	All
Disability	0%	>20%	>10%
Family (children or dependence persons in charge)	0	2	1
Ethnic (race)	All	All	All
Religion	All	All	All
Economic Level	Low	Medium	High

The final set of indicators for each of the dimensions will be stated in Chapter 3, for each of the use cases. Figure 2-1 summarizes described dimensions with respect to the DIAMOND measures which will be proposed in order to obtain gender inclusive transport system.
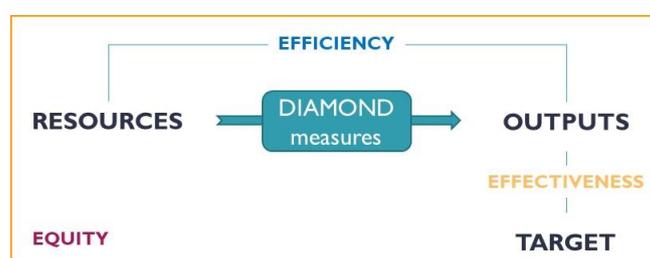

Figure 2-1 Productive equity analysis

In summary, the 3Es methodology applied in the context of the DIAMOND project will provide answers to the following set of questions:

- How much does it cost to produce a more inclusive transport system?

- Do the measures proposed produce the desired outputs, outcomes and gender-related benefits or impact?
- Do the measures achieve the targeted inclusiveness levels or address specific gender-related needs?

Based on these findings, the general 3Es framework for gender-responsive transport system is illustrated in Figure 2-2 below.

The significant factor to consider is the definition of a criterion for selecting fairness measures to assess for positive or negative equity impacts on the target population. For this, each of the use-cases, a set of preferable fairness measures will be selected in the data analysis phase of the project. KPIs related to efficiency and effectiveness will be derived from the validated fairness measures. The picture of the distributional model promoted by the DIAMOND initiative will be obtained by equity-related indicators. In order to assess the extent of impact between the efficiency, effectiveness and equity, dimensional and cross-dimensional analysis will be conducted. All measures specified for each use-case will result in an impact with different performances from the aspect of efficiency, effectiveness and equity.
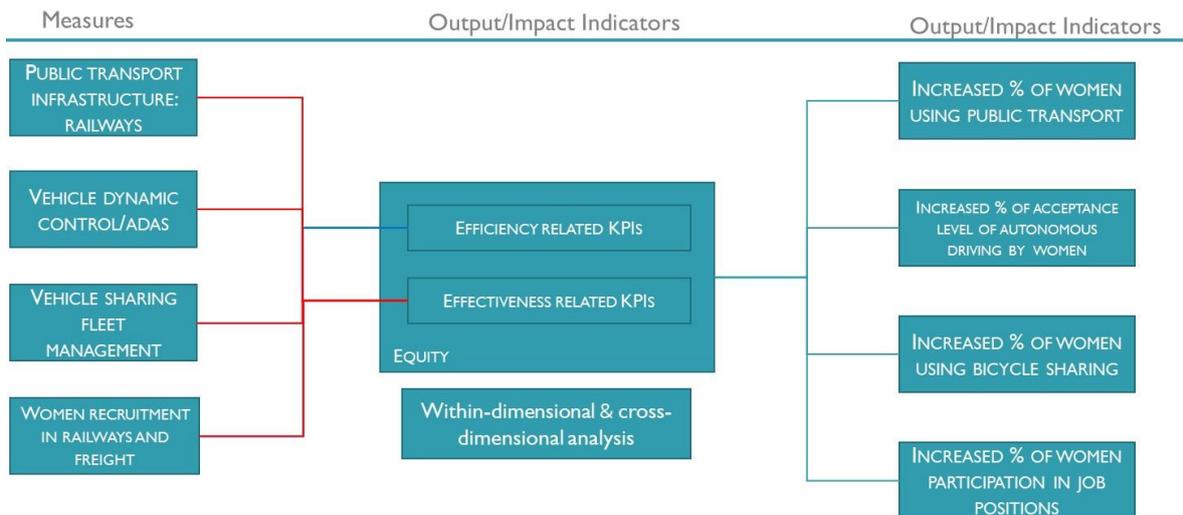

Figure 2-2 General 3Es framework for gender responsive transport system

2.3 Data requirement and timeline

The incorporation of equity analysis into the CBA framework; in other words, an equity-efficiency-effectiveness analysis will have implication for data input and the outcome of transport project appraisal. However, since equity analysis also focuses on the same benefits and costs as regular CBA, the same set of data used for CBA would be used for the equity analysis. Additionally, it is necessary to collect more detailed data than in regular CBA in order to estimate the costs and benefits according to population group under investigation (DIAMOND's PI).

Moreover, since the implementation of the fairness measures proposed by DIAMOND is not anticipated in the course of the project, estimation of the real impact of the fairness characteristics or fairness measures is not possible. We, therefore, propose to design a stated preference survey based on hypothetical scenarios using the validated fairness characteristics or fairness measures for data collection and impact analysis. [AA6] Furthermore, the selection and definition of the actual indicators for impact assessment and equity analysis will follow the production and validation of the final set of fairness characteristics.

The process of selecting indicators for impact evaluation must address the following concerns:

a. The data requirement and measurement metric for each indicator;
b. The frequency or period of measurement;
c. Where the data should be collected;
d. How the data will be collected;
e. The target group of the data collection;
f. The expected baseline for each indicator.

The information needs for the impact assessment will be use-case specific, accordingly, different methods of data collection (measurement) can be chosen including:

g. Direct measurement using specific software and/or simulation tools;
h. Direct observation or recording of events within the Living Lab;
i. Surveys by:
   - Questionnaire;
   - Interviews;
   - Diary completion.
j. Collection from historical records;
k. Use of focus groups and stakeholder meetings.

Data collection for 3Es based impact assessment will start immediately after the selection of the final set of fairness measures and the corresponding set of efficiency and effectiveness indicators.

Parallel to this process, scanning of existing state or ex-ante assessment (without implemented measures) will be conducted. All above listed methods for data collection will be considered as the mean for collecting the data needed for ex-ante assessment and ex-post evaluation of efficiency, effectiveness and equity dimensions of DIAMOND related innovations.

3 Use-cases: definition, selected metrics and 3E performance evaluation

3.1 Use-case I: Public transport infrastructure. Railways

3.1.1 Definition of the use case

The aim of the Use-Case I is the improvement of the quality of railway infrastructure - the railway stations in particular, from a gender perspective, understanding women's needs in terms of accessibility, convenience and safety issues inside the stations but also in the accesses to the station.

The use-case goal is to increase the percentage of women using public transport during peak and off-peak hours. This will allow the evaluation of the station at times when the ingress and egress of people to the station is high and also at those hours at which the number of people is low, and women could feel less safe.

Based on the selected fairness characteristics (as the main attribute that we would like to distil from the use case as a way of assessing the services) the set of fairness measures as the actions that will allow improving the fairness characteristics will be defined. In order to assess the efficiency, effectiveness and equity of the measures, we selected the metrics that will be used for measuring their impact.

3.1.2 UC I: Selected metrics

The set of KPIs is aligned with the fairness characteristics. For example, fairness characteristics in case of UC1 are those aspects that different and diverse female users find important for a comfortable, safe and useful railway service. More precisely, women's inclusion with a focus on usability, accessibility, comfort, design, maintainability, availability, punctuality, reliability, security and safety of railway transport services is considered in this case.

The following sections contain the set of efficiency, effectiveness and equity-related indicators. The list of indicators is preliminary, subject to change depending on the preferred fairness characteristics (and the fairness measures agreed upon with) which will be selected based on the surveys and focus group interviews.

3.1.2.1   UC I: Efficiency

Until recently, resource allocation for public service provision was based on a single-dimension criterion of achieving greater economic efficiency (Brill, 1979; Athanassopoulos, 1998). As already defined, efficiency measures whether resources (financial assets, mobile capacities or infrastructure) are being used judiciously. Therefore, efficiency is concerned with the relationship between resource inputs (cost in the form of labour, capital or equipment) and outcomes (number of woman passengers in public transport during peak and off-peak hours, and the number of trips made in public transport by women).

The set of preliminary efficiency indicators for the UC1 for each of the fairness characteristics (FC) is summarised as follows.

FC1: Service availability and efficiency

- The service frequency (train-km per inhabitant): Increase of the service frequency (toward suburbs during the off-peak hours) – ratio of invested resources (labour, vehicles and energy) and (women) related passenger train-km;
- Free seat availability during the peak hours (ratio of number of passengers and number of seats during the peak hours): ratio of inputs (locos, wagons, trains, labour – potential measures: run longer trains, ticketing options for commuter trains) and outputs (the number of women passengers during the peak hours);

- The connectivity of rail with other modes in the suburbs during the off-peak hours: the ratio of the costs (investments related to inefficient stop location or timetable synchronization) and the outputs (passenger flows to suburban during off-peak hours).

FC2: Information provision

- The ratio of the costs for installing the system for real-time crowding information provision and the effects in terms of higher number of women passengers.
- Availability of real-time arrival prediction systems in stations.
- Availability of online information for departure and arrival times for any train on the network.
- The availability of apps to provide real-time information on arrivals, delays and timetables, the ratio of cost verse effect.

FC3: Ticketing options and fares

- Ratio of costs for the provision of public transport discount for women (off-peak and/or weekend discount, reduced fee for families, children, retired people, disabled persons) and the effects in terms of an increased number of women users.

FC4: Design of infrastructure

- Furniture and facilities: Maternal waiting rooms/Investments in infant waiting rooms/areas, nursing rooms/areas; separate male/female toilets, amusement facilities for kids versus the effect from the aspect of attracted women as a passenger;
- Implementation of priority queues in stations – investments vs effects;
- Consideration of priority cabins and seats in trains for pregnant women/seniors/parents with young children in strollers/priority seating card and estimation of effects;
- The enhanced training for transport workers to ensure they are equipped to assist people with disabilities, ratio of costs and effects;
- Estimation of costs of enabling barrier-free access to train/metro stations and the effects in terms of an increased number of female passengers.

FC5: Safety and security

Assessment of the ratio of costs and effects of the following measures:

- Introducing women-only carriages;
- Formal surveillance (CCTV, increasing of Police/transport staff);
- Natural surveillance – better visibility and improved lighting;
- Raising awareness – advertising campaigns;
- Online platforms for sharing experiences of sexual harassment;
- Emergency alarms, panic buttons, phone, strips;
- Legislative reform – harsher punishment for offenders.

3.1.2.2   UC I: Effectiveness

General goals that should be achieved within UC1 are:

- Increase in the number of woman passengers in public transport during peak and off-peak hours and the number of trips made in public transport by women;
- Increase in % customer satisfaction (number of women who are satisfied with new/improved transport service provided).

The expected goals are the increase of women as passengers and customer satisfaction. Therefore, the effectiveness of all fairness measures should be considered based on the level of attained general goals.

If we consider the main characteristics in relation to women use of rail transport services, we may derive the following subset of effectiveness indicators for the UC1:

FC1: Service availability and efficiency

- Perceived level of satisfaction of users with improved service frequency;
- Perceived quality of measures related to increasing the seat availability during the peak hours.
- The perceived level of effectiveness of the measures to improve the connectivity of rail services with other modes in the suburbs during the off-peak hours.

FC2: Information provision

- Perceived quality of introducing improved information provision means.

FC3: Ticketing options and fares

- Perceived level of satisfaction of women with redesigned tariff policy.
- Perceived satisfaction of users with redesigned rail transport service (increased service frequency, provision of reduced tariffs for women).

FC4: Design of the infrastructure

- Estimated quality of improved railway infrastructure (maternal waiting rooms, priority queues, priority cabins in trains, barrier-free access to train/metro).

FC5: Safety and security

- Perceived level of effectiveness of security-related measures from the aspect of women users.

3.1.2.3 UC I: Equity

Limited resources for applying different fairness measures always raise the question of justice. Therefore, equity considerations are inseparably linked to fair processes of resource allocation.

The equity dimension in UCI is assessed by quantifying the ratio of ethnic and socio-economic distribution. More precisely, for each of the selected efficiency and effectiveness indicators, the score will be calculated for each of the different profiles of PI (Table 2-3).

3.2 Use-case II: (Emotion in) Autonomous Passenger Car

3.2.1 Definition of the use case

The goal of Use Case II is to increase the level of acceptance of women towards autonomous driving technology.

AV technology is an emerging industry, which is expected to make driving easier. Levels of vehicle automation range from driver-assist technologies (e.g., lane-keeping, parking assist, etc.) to full vehicle automation, in which the vehicle is responsible for all safety-critical functions. Whereas partially automated vehicles have already entered the market, fully autonomous vehicles are still in development (Olsen & Sweet, 2019).

The objective of the Use Case II is to investigate the acceptance level for women as users of autonomous vehicles and support the development of fully automated cars capable of adapting to the driving behaviour and performance to women.

3.2.2 Selected metrics

The set of KPIs for UC II is aligned with the fairness characteristics. For example, fairness characteristics in UC II are the most significant factors influencing the experience of women as users of autonomous vehicles and the role of future technologies (Böhm et al., 2017). More precisely, women's inclusion with a focus on vehicle efficiency, accessibility, comfort, design, security and safety of autonomous vehicles are considered in this case.

The following subsections discuss the set of efficiency, effectiveness and equity-related indicators to the Use Case II. The final list of indicators is subject to the outcome of the data collection and analysis of the fairness characteristics (and the fairness measures agreed upon with). This will be determined from the surveys and focus group discussions.

3.2.2.1 UC II: Efficiency

The efficiency is estimated through a benefit-cost approach as the difference between the total transaction cost in implementing a scheme and the gross welfare effects induced by the scheme on society: succinctly, are the targets being achieved at minimum cost?

AVs do represent not only sustainable transport alternative but also an inclusive transport mode for the mobility challenged (older people, people with temporal /permanent disabilities and people without driving licenses).

In order to increase women's trust in AVs as safe and convenient means to fulfil their mobility needs, the issue of gender difference in driving behaviour and performance must be addressed in the design and development of AV technology.

The set of preliminary efficiency indicators related to measures that will encourage more women to accept and use AVs are summarised as follows

FC1: Safety/Security

- The ratio of investments in providing connectivity and traffic information exchange for autonomous vehicles technology and the effect in terms of reduction in the number of traffic accidents, particularly older women;
- The effect of investment in autonomous vehicle technology on reducing fatal traffic accidents resulting from human errors (i.e., inattention, judgemental errors, distractions, fatigue etc.);
- The ratio of the cost of reskilling drivers on Dynamic Driving Tasks (DDT) (sufficient skills for drivers to take over control from the autonomous vehicle and the other way round) in an emergency and the effect on women acceptance.

FC2: Comfort

- The effects of the utility of the travel time in AVs for other productive activities on the level of women acceptance.

- The effect of the reduction in driving related stress by AVs on the subjective wellbeing of women.

FC3: Mobility

- The effects of travel time saving by introducing AV technology on the number of women accepting and adopting AV technology to meet their mobility needs;
- The efficiency of awareness campaigns and promotions about the benefits AV in meeting the mobility needs of women (old, with disabilities and without driving licence), the ratio of investment and effects (number of the target population adopting AV).

FC4: Economy

- The ratio of the cost of developing the AV technology and the cost of fuel-saving by AV.

FC5: Environment

Assessment of the ratio of costs and effects of the following measures:

- Environmental benefits (cost of the reduction in road transport emission and noise)

FC6: Design Options

- The ratio of investments in providing infrastructure (digital and physical) and the effect on women acceptance and usage (% increase in the number of women using AVs).
- The ratio of the investment for developing AV communication technology, lighter vehicle and cost-saving in fuel consumption;
- Development of functional Human Machine Interface (HMI), investment versus effects;
- Development of Coordinated automated road transport (C-ART) for traffic coordination;
- Investment versus benefits (e.g. overall fuel/energy consumption and emissions reduction, traffic safety, travel time and travel costs savings, etc.).

3.2.2.2 UC II: Effectiveness

The General goals that should be achieved within UC II are:

- Increase % of acceptance level of autonomous driving by women
- Increase in % of women using Autonomous vehicles
- Increase in % of user satisfaction (number of women who are satisfied with AVs)

The expected goals of the Use Case II are to ensure that the needs and expectations of women are considered in the development of AV technologies, and increase the level of satisfaction and number of women using autonomous driving technology. The effectiveness of all fairness measures should be considered based on the level of attained general goals.

If we consider the main characteristics in relation to women's acceptance and use of Autonomous vehicles, we may derive the following subset of effectiveness indicators for the Use Case II:

FC1: Safety/Security

- Perceived level of satisfaction of safety/security measures of AVs from the perspectives of women users.

FC2: Comfort

- Perceived level of trust and confidence of women in terms of using AVs to meet their mobility needs.

FC3: Mobility

- The perceived level of satisfaction of women on the benefit of AVs (e.g. meeting the mobility need of older women, women with disabilities and women without driving licences, as well as reduced travel time and travel costs);

FC4: Economy

- The perceived level of the effectiveness of AVs in terms of reducing travel cost and travel time.

FC5: Environment

- The level of the effectiveness of AVs in reducing the negative impact on the environment.

FC6: Design Options

- The effectiveness of improved road infrastructure and vehicle technology on mobility (connectivity, C-ART, HMI).

3.2.2.3 UC II: Equity

Limited resources for applying different fairness measures always raise the question of justice. Therefore, equity considerations are inseparably linked to fair processes of resource allocation.

The equity dimension in UC II is assessed by quantifying the ratio of ethnic and socio-economic distribution. More precisely, for each of the selected efficiency and effectiveness indicators, the score will be calculated for each of the different profiles of PI (Table 2-3).

3.3 Use case III: Bicycle sharing

3.3.1 Definition of the use case

The aim of the Use Case III is to increase the usage of bicycle sharing by women.

The focus will be the design and locations of pickup and return points for bicycles and the planning and distribution of bicycle fleets suited to women's needs. For example, we will be examining the locations of bike-sharing points and their convenience for women and whether current bike-sharing companies provide the opportunity for women to hire safety helmets and child seats, which could affect and increase women uptake for this mean of transport.

3.3.2 Selected metrics

The set of KPIs for UC III is aligned with the fairness characteristics. For example, fairness characteristics in case of UC 1II are those aspects that are the most important in relation to women's increased use of bike-sharing opportunities.

Next subchapters contain the set of efficiency, effectiveness and equity-related indicators. The list of indicators is subject to change depending on the preferred fairness characteristics (and the fairness measures agreed upon with) which will be selected based on the surveys and focus group interviews.

3.3.2.1 UCIII: Efficiency

Bicycle sharing represents a transport strategy that contributes towards achieving sustainability and inclusiveness in the cities. Shared use of bicycle fleets constitutes not only a sustainable transport alternative but offers the opportunity to develop an inclusive transport system, which would address social-spatial disadvantage.

In order for bike-sharing to become a competitive mode of urban transit, the issue of gender inequity must be addressed. In general, there is an imbalance in the use of bicycles across genders and age groups in countries with a low share of cycling. In contrast, countries and cities with higher share of cycling have much lower gender differences, even opposite in some cases (Netherlands or Denmark)[2].

The set of preliminary efficiency indicators related to measures that will encourage more women to cycle are summarised as follows.

FC1: Accessibility and spontaneity

- The ratio of the costs for organizing local cycling campaigns and effects in terms of a higher share of women bicyclists;

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[2] https://www.theguardian.com/cities/2015/jul/09/women-cycling-infrastructure-cyclists-killed-female

- Recruiting more female cyclists – the ratio of costs through introducing the redesigned bike-sharing schemes (discount, reduced membership fee) and the effects in terms of higher revenue from female users;
- The ratio of optimizing the position of bike-sharing stations (combining with dockless bike-sharing) and the effects in terms of increased women cyclists;
- The efficiency of introducing the bikes with child seats and carriers – the ratio of costs and revenues from increased use;
- The effect of investment in bike shelters, bike racks or other storage solutions in terms of increased revenues/number of women users.

FC2: Safety and security

- The ratio of investments in reducing the risk of car-on-bike accidents (like investments in protected bike lanes, measures for increased visibility of bicyclists/bicycle paths during the night, increased safety on intersections, etc.) and the effects in terms of reduced number of accidents.
- Investments in increased security of women cyclists (personal alarms, cameras, etc.) versus the number of women users.

FC3: Social constraints

- Efficiency of awareness campaigns/cycling courses about the recognition of cycling in low-income and minority neighbourhoods, the ratio of costs versus the effects (revenues/number of female users);
- Investments in family-friendly bike sharing through enabling kid's seat for shared-bikes, ratio of investments and revenues (increased use of bike sharing system by mothers with children).

FC4: Weather and topography

- Equipping some docking stations with electric bikes/scoters - costs versus effects.

3.3.2.2   UCIII: Effectiveness

General goals that should be achieved within UCIII are:

- % Increase of use of bike sharing by women;
- Increase in % customer satisfaction (number of women who are satisfied with bike sharing service provided).

The expected goals are the increase of women as users of bike-sharing and their satisfaction; therefore, the effectiveness of all fairness measures should be considered based on the level of attained general goals.

If we consider the main characteristics in relation to the women's use of bike-sharing, we may derive the following subset of effectiveness indicators for the UCIII:

FC1: Accessibility and spontaneity

- Perceived level of satisfaction of women users with the measures aimed for the improvement of bike-sharing accessibility

FC2: Safety and security

- Perceived level of safety/security of women cyclists after introducing the measures for improving the safety/security of women bicyclists.

FC3: Social constraints

- Perceived level of satisfaction with introducing the family-friendly bike-sharing.

FC4: Weather and topography

- Perceived user effectiveness of electric bike-sharing system in terms of reducing the car use and easing traffic congestion.

3.3.2.3 UCIII: Equity

The equity dimension in UCIII is assessed by quantifying the ratio of ethnic and socio-economic distribution. More precisely, for each of the selected efficiency and effectiveness indicators the score will be calculated for each of the different profiles of PI (Table 2-3).

3.4 Use case IV: Women recruitment in railways and freight/CSR protocols

3.4.1 Definition of the use case

The objective of use-case IV is to increase women's participation as employees in the transport sector, including off-site professional positions - vehicle drivers, maintenance technicians and other currently less attractive positions for women. One of the proposed actions is to incorporate CSR protocols with employment and look to introduce new protocols in CSR for the transport and logistics industry.

Key aspects of fairness which are related to this use case, and which will serve as a base for defining the efficiency and effectiveness indicators, are:

- Procedural justice: Equity and fair treatment amongst all rank of employees, regardless of their background, experience, or perceived value to the business;
- Distributive justice: Relates to the access to suitable training to support employment, job retention and promotion.
- Equality of opportunity: Equal chance for everybody to apply and be selected for posts, to be trained, to be promoted and to have their employment ended fairly.
- Social justice: Providing legal framework within which employees and employers can bargain collectively for the improvement of conditions of employment, promoting fair labour standards, promoting employees' participation in decisions affecting their interests

in the workplace, enforcing legal provisions (securing the fair and effective resolution of disputes and unfair labour practices, working shift patterns and work-life balance).

Therefore, UC IV will help us to understand not only how the transportation sector provides opportunities for women to organise their everyday life and to access jobs, but also to understand the characteristics of the transport sector in the context of employment opportunities and to assess the transport sector as a labour market segment that should provide equal employment opportunities for women. This will provide insights on the level and characteristics of the employment of women in the transport sector and help to define the challenges that women face in finding employment in the sector as well as opportunities to enhance their participation.

3.4.2 Selected metrics

Regarding the impact expected from the fairness measures, the aim of UC IV is to increase the number of women working in the transport sector.

In order to select the efficiency and effectiveness indicators, different aspects of employment in the current transport system are considered including issues related to job conditions, the influence of individual characteristics in jobs and careers, and fair job offers.

The following sections contain the set of efficiency, effectiveness and equity-related indicators. The list of indicators is subject to change depending on the preferred fairness characteristics (and the fairness measures agreed upon with) which will be selected based on the surveys and focus group interviews.

3.4.2.1 Efficiency

As in previous Use Cases, efficiency measures in UC IV reflect the ratio between investments (cost in the form of labour, capital or equipment) and the outcomes (number of woman employees on off-site professional positions in the transport sector)

The set of preliminary efficiency indicators for the UC IV is summarised as follows.

FC1: HR policies

- Redesign of recruitment process (promotion activities, materials, campaigns, a minimum quota of positions to be filled by women, internal recruitment campaigns) should be changed to attract more female candidates. The ratio of the costs of redesigning and the effects in terms of a higher number of women candidates;
- Ratio of the costs dedicated to improving the procedures for applying and training on some off-site professional jobs (train driver, bus driver) and the number of women candidates on these positions.

FC2: Carrying and preventing responsibilities

- Introducing gender-inclusive working time models (flexi-time, part-time and geographically independent work, job sharing) that allow a better balance of work and family life. Ratio of the costs and effects related to the number of employed women;

- Introducing work-life balance policy (part-time individual labour contracts for women who take care of children aged up to 6 years, medical checks during the working hours for pregnant employees).

FC3: Safety and security

The ratio of costs and effects in terms of the number of women employees on those positions classified to pose a high safety risk for woman for measures related to the establishment of a safe working environment such as:

- Setting up and maintaining the database to record any form of violence against workers by gender;
- Developing clear procedures that must be followed in case of violence;
- Organising zero-tolerance campaigns;
- Organising various forums and regular meetings to discuss the steps in combating violence and more specific gender-based violence in the workplace.

FC4: Female facilities

- Installation of adequate gender-specific toilet facilities, canteens, lockers, break rooms and changing rooms in work environment (stations, terminuses) – the ratio of the costs and effects in terms of the number of women employees.

FC5: Educational level and attainment

- Measures for future staff development (recruitment materials for attracting female candidates, engagement at schools, colleges, universities and career fairs to promote the benefits of working in transport and tackle the issue of gender stereotyping) – the ratio of costs of these measures and the effects in terms of number of female candidates or transport sector professionals.

3.4.2.2   Effectiveness

Considering the effectiveness, the general goals that should be achieved within UC 1V are:

- Increase % of women employees through the number of women engaged in those positions that are currently less attractive for women (off-site professional jobs - train/bus drivers, maintenance technicians, etc.);
- Increase in % satisfaction of women (number of women who are satisfied with improved working conditions).

Therefore, the effectiveness of all fairness measures should be considered based on the level of attained general goals.

If we consider the main characteristics in relation with the women as the job holder in the transport sector, we may derive the following subset of preliminary effectiveness indicators for the UC 1V:

FC1: HR policies

- Measuring of advanced HR practices through the satisfaction of employee (employee satisfaction index), employee churn rate, absenteeism and productivity rate.

FC2: Carrying and preventing responsibilities

- Estimation of effectiveness of time-spatial flexibility practices for work-life balance of women employees in the transport sector in terms of satisfaction and productivity.

FC3: Safety and security

- Perceived level of effectiveness of security-related measures from the aspect of women employees.

FC4: Female facilities

- Perceived satisfaction of women employees' adequate gender-specific facilities.

FC5: Educational level and attainment

- Perceived level of effectiveness of measures for future staff development;

3.4.2.3   Equity

The equity dimension in UC IV is assessed by quantifying the ratio of ethnic and socio-economic distribution. For each of the selected efficiency and effectiveness indicators, the score will be calculated for each of the different profiles of PI (Table 3).

4 CONCLUSIONS

The deliverable describes how efficiency, effectiveness and equality considerations can be integrated into the CBA framework for the assessment of fairness measures for gender inclusiveness in the transport sector.

The assessment is based on a 3Es framework, incorporating the concepts of equity, efficiency and effectiveness, which are among the essential factors in performance evaluation of any type of investment in the public sector.

In the context of impact assessment of measures for gender inclusiveness in the transport sector, efficiency is concerned with the relationship between outputs (effects of fairness measures) and inputs (allocated resources) – concerned with maximizing gains while minimizing costs. Therefore, efficiency is to achieve the most for available resources. The effectiveness criterion is determined by the distance between observed outputs and a set of desired goals. It is concerned about whether a particular fairness measure achieves some specific outcomes, the designation of which is couched upon some values. Equity is a distributional principle applied to the allocation of services and benefits in order to achieve what is considered a fair division. In this case, equity dimension treats the distribution of fairness measures on different profiles of Polyhedral Individual.

For each of the UCs, the set of efficiency, effectiveness and equity-related indicators are selected. These indicators will be assessed in subsequent stages of impact assessment (WP7). This preliminary set of indicators is subject to change depending on the preferred fairness characteristics (and the fairness measures agreed upon with) which will be selected based on the surveys and focus group interviews. Special attention will be given to the assessment of trade-offs between efficiency, effectiveness and equity of the chosen measures. By analysing alternative combinations of inputs/outputs of the selected measures, the efficiency vs effectiveness vs equity will be evaluated. Efficiency, effectiveness and equity of proposed measures will be estimated since the measuring of real impact is not possible due to the time scale of DIAMOND project and impossibility to implement fairness measures and measure the real impact on the field during the project timescale.

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