

# Method of Assessing Social Benefits of the Development of Inland Shipping Infrastructure in Poland

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k x                      x   z                      x   x   z                      C   z   z                      x   xz                      z   C  
                              x                      x   Cx   x                      x   x                      xz                      x                      z   x                      C   EE  
                              x                      z                      E   X                      x   C                      x   z                      x                      x  
                              xzz                      x                      z   E                      x   C   x                      z   x                      zx                      x   z                      C   z   x  
                              x   z                      y                      y   zrHEk                      z   x                      x   y                      x   x                      C   z                      y                      x                      C  
x   x   x                      x   x                      E<sup>H</sup> X                      xz                      z                      z   z                      x   y   z                      z   x                      C  
x   x                      z                      z                      Cx   x                      z                      y                      x   x                      C   x   xy                      x                      z                      z                      C  
xz   zx                      x   x                      z                      x                      y                      x   x                      x                      x                      E<sup>J</sup>  
k                      x                      y                      zx                      x                      x   x                      x   z                      x                      r<sup>KL</sup>   y  
x   x                      z   z   x                      z                      x   x                      x   x                      x                      Ek                      x                      x                      y                      x  
y                      x                      x                      x                      z                      x                      x                      x                      x                      x                      x                      x                      x  
z                      x                      x                      x                      x                      x                      Cx   x                      x                      x                      x                      z                      x                      y                      xz  
                              x   z                      E  
**Keywords:**    x                      C                      x   z                      x                      C   z   x   z                      E

HE   e   ki                      l   k                      e    x                      x                      x                      x                      x  
                              X                      x                      z                      z                      D                      x   z                      z                      x                      z                      z                      z                      x                      x                      z                      x                      z                      x                      z  
                              l                      z                      x                      y                      z                      z                      x                      E                      z                      x                      x                      y                      zx  
                              x                      rME                      k                      -                      z                      x                      C                      z                      x                      z                      x  
y                      x                      x                      x                      z                      x                      zx                      y                      C                      z                      z                      x                      C                      z                      x  
                              z                      x                      z                      E                      zx  
                              x                      z                      x                      x                      y                      zx                      x                      x                      xz                      R                      x                      y                      zx                      x  
                              x                      x                      x                      x                      Ek                      z                      z                      C                      zx                      C                      x                      z                      x  
                              z                      z                      zx                      y                      z                      -                      x                      xzz                      z                      z                      z                      zx                      zx                      z                      x  
-                      x                      -                      z                      x                      -                      z                      x                      z                      z                      x                      -                      xy                      z                      x                      x                      R                      z                      x  
                              z                      y                      z                      z                      y                      z                      z                      R                      -                      x                      z                      C                      z                      C                      x                      x  
                              z                      z                      y                      z                      z                      x                      -                      x                      z                      z                      z                      z                      C                      z                      C                      x                      x                      y  
                              C                      z                      zx                      x                      z                      z                      x                      z                      z                      x                      Cz                      z                      z                      x                      z                      z                      x                      y  
xz                      x                      Cx                      x                      x                      x                      xz                      z                      z                      z                      C                      z                      z                      z                      x                      z                      z                      x                      C                      z                      z                      z                      x  
x                      x                      x                      x                      C                      zx                      x                      x                      x                      z                      C                      x                      x                      z                      z                      x                      z                      C                      z                      x                      z                      z                      z                      z                      z  
zx                      x                      z                      x                      x                      x                      zx                      z                      E                      x                      z                      C                      x                      x                      z                      z                      x                      z                      C                      z                      x                      z                      z                      z                      z

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<sup>H</sup>Xzz    e   x                      x                      jz                      x                      z                      x                      y                      x                      x                      x  
                              C                      l                      G                      L                      x                      x                      x                      x                      x                      x                      x                      x  
                              y                      M                      d                      C                      K                      e                      C                      H                      j                      x

k x x x z xzz C C x x z x z  
 x x x y x ? G EHG  
 x x x IPPLC j z y I H z x  
 x zx zx y x x x x  
 z z x x x x z x x y x E  
 x x z x C x yx C EE l e k rHC  
 y E x x x x i i rH C e i XjH n rH C I GGL x  
 x z x x x x x x x z x  
 z x x xzz C Cx y y d x z x rHC x  
 x x x E EX  
 HPPKC x z C z z x x x z z y zx  
 ? z z yx x C x z x x x x  
 z x xzz C x z ?kxy HE  
 xzz K e C x

kxy Hed x x x x x z x y ? l i HGGG

	i x		i x		x x x		j j x j	
	d ?GG LK	d	d ?GG LK	d	d ?GG LK	d	d ?GG LK	d
Xzz	LKK	KJ	HKM	HK	G	e y	G	e y
e	I GHO	I O	J KL	GP	G	e y	G	
x	NCL	OP	J O	KM	JG	M	IG	LOM
x	GNP	OM	GL	KM	e y	z x	e y	z x
x z	I KL	KJ	I P	JN	HG	KJ	c x HG	J K
	LKL	HO	OTJL	x zxy	e y	KE	e y	x zxy
k x	IKH	KJ	H OL	HG	d x LG	HGG	d x KG	PG

j z rHGGK

z x z x z z EO X x zx z x  
 X y zx C z x z x z  
 x z x C x n x zx  
 y IGGHC z x -  
 Cz x z x C C xzz x x z x l z x z  
 z x x x E x y x x zx x  
 Xzz x n E  
 x C z xzz x - z xzz  
 l IGGGzx I x  
 x Ek z z x z xzz C z x x C zx xz C  
 y y x Cx KL y z x x E  
 C z z ? z  
 z zx x x z x IGGM Xk y D  
 x z x y xy x E x x C z x  
 rP IGG x x z x x  
 z y x x E y zx zx z  
 y zx C C x z x C Xk z z  
 x y x x x y x z x x x x  
 x C E k z x x z  
 z x z x x xzz E X x  
 xzz z C x z C x x xz

HK

Ek x x y x  
 y x z ErHMCHD IGGNCx  
 d X k rHP x y C z  
 x x x y y zx  
 C xz z x y Cx  
 x x rHHCCHC l z  
 x z z rI Cx x x x x  
 x x x xz z x z  
 x El Xk C  
 x E x z x y x

IE i j d k j i k  
 mXcl Xk e e kj Xi je  
 i d k m c d e k  
 e cXe j e e cXe

z x x C z C  
 zx xz xy C x x  
 x x x x x x  
 x x x x  
 Xzz xy  
 xzz y x C x  
 z x y x El x C  
 x x x xzz  
 zx xz x y x  
 x x C z zx C  
 x x C z z z C  
 x z x x z? x  
 x E  
 k z x x  
 z x y x x zx  
 x x x x x

xzz x z xz  
 zx x x x z z  
 z x E z  
 j zx y z  
 x z x ?B<sub>is</sub>)C  
 zx y x x C  
 z x z x y x  
 x (C<sub>rt</sub>)x x x x x (C<sub>isj</sub>)  
 z x B<sub>is</sub> = C<sub>rt</sub> - C<sub>is</sub> ?H  
 zx x x x z z  
 z x x x  
 x (C<sub>pji</sub>)C z x

x z xzz ?C<sub>art</sub> x z x z D  
 ?C<sub>crt</sub>)  

$$C_{rt} = \sum_{i=1}^n C_{pji} + C_{art} + C_{crt} \quad ?I$$
 x x x x x z  
 x (C<sub>isj</sub>) z z x  
 z x z x C C C  
 y xz C z z  
 x xzz  

$$C_{isj} = \sum_{i=1}^n C_{pji} \quad (3)$$

$$C_{isj} - x z x y x$$

$$C_{pji} - z x y Fyx j x$$

$$Fyx j x$$

$$Fyx j x$$
 n - y x x x C L  
 x z x x C C zx y  
 C C D x x  
 x z z  
 k z x x  
 y y x z x Fyx F x z j  
 zx y yx x x  
 z x ?FC<sub>AVEj</sub>)C  
 x x x x ?e<sub>i</sub> y x  
 x x rLC x z  
 x x rMx x z x x  
 x ?c<sub>i</sub> rH  

$$C_{pji} = FC_{AVEj} \cdot e_i \cdot c_i \quad ?K$$
 x z x C z x y  
 yx x x x x  
 x x E<sub>j</sub> z x IJ  
 x x x x zx yx x x rNC  
 x x z x z x  
 x ?c<sub>PM</sub>) x zx y x  
 z x x yx ?c<sub>m</sub>)x D yx  
 x x  

$$C_{PM} = u_m \cdot C_m + u_z \cdot C_z \quad ?L$$

$$u_m - k x yx x x x$$

$$u_z - k x D yx x x$$
 x z R zx y yx  
 y x x zzz  
 z x Cx zx  
 z y z x x EXzz  
 z x d X k rHP C  
 x x zx y z IM FEX  
 z z z x xz C

x x IGHGDGH x  
 x x z x i x  
 z x x z x x  
 y J x H F E  
 C yx  
 z x z x x  
 y x z x x x  
 z x x z x x EX x  
 x z x z z x z x  
 x x Cyx x x z  
 x x x x z x x  
 x x x C y  
 x (FC<sub>AVE j</sub>) xzz x z  
 xE  
 x

$$FC_{AVE j} = \left( \frac{FC_{US j}}{v_{US j}} + \frac{FC_{DS j}}{v_{DS j}} \right) \cdot \frac{\rho_{FO}}{2 \cdot CAP_j} \quad ?M$$

x x

$$FC_{AVE j} = \frac{FC_{RV j} \cdot \rho_{FO}}{CAP_j} \quad ?N$$

FC<sub>AVE j</sub> - x x z  
 Fyx F z j x  
 ? F D  
 FC<sub>US j</sub> - x x z  
 Fyx x ? JF  
 FC<sub>DS j</sub> - x x z y x  
 x j x ? JF  
 v<sub>US j</sub> - x x x j  
 x ? F  
 v<sub>DS j</sub> - x x  
 x x j ? F  
 CAP<sub>j</sub> - x x F yx F z  
 ?  
 ρ<sub>FO</sub> - ? F J

X z x z z x z x  
 z x z (C<sub>art</sub>) x z x

$$C_{art} = \frac{p_{rfa} \cdot c_{fa} + p_{rsia} \cdot c_{rsia}}{Q} \quad ?O$$

C<sub>art</sub> - z x xzz ? l i F  
 Q - x x ?  
 p<sub>rfa</sub> - yxy xx x xzz  
 ? <sup>DH</sup>R

p<sub>rsia</sub> - yxy x  
 ? <sup>DH</sup>R  
 c<sub>fa</sub> - x x z x xx ? l i  
 c<sub>fa</sub> - x x z ? l i  
 X z x xz C z  
 x xzz C x y zx C  
 z z z x x E  
 x x Cx x  
 yxy x xzz x x x  
 x x zx Ek x x x yx  
 x x z zx y x  
 z x e x x i x x d x  
 IGHG r l O x x xzz x z C  
 xzz x  
 x x xzz

$$p_{rfa} = \frac{L_f}{\sum_{i,j=1}^{m,n} s_i \cdot n_{ij} \cdot 365} \quad ?P$$

$$p_{rsia} = \frac{L_{si}}{\sum_{i,j=1}^{m,n} s_i \cdot n_{ij} \cdot 365} \quad ?HG$$

L<sub>f</sub> - y xx x  
 xzz x x x IGHG  
 L<sub>si</sub> - y x  
 xzz x x x IGHG  
 S<sub>i</sub> - x z i r  
 N<sub>ij</sub> - y z j x z  
 i r H x  
 n - y z C N  
 y C zx C x C z C z x  
 x Cy x xz z  
 m - y x z  
 k x zx xz Dz zx zx  
 x z z x z x ?  
 zx z xzz PG z z  
 z z z C z x C  
 x z ? z z x C  
 x z x C x z  
 z Cx x z x xy E  
 k y x z z Cyx  
 D x C x x x  
 x z x y d X kErHP  
 k x x x xzz x x  
 x l IGHGE  
 X z yx Xk  
 x d X k x y z y

yx            x            IGHC                            D JMN                    NP                    x    x  
 l i jkXk xxErP                            D NO                    PJO                    m    x  
 JE i j l c k j                            x    x                    D                            Dn    x  
 k            x z                    x            x    x                    x    x EJG  
 z    x            x            x  
 kxy IEX x            z                    x    x            x    x            z                    x z x z            x

xx	x x x	nn	nn	nn	nn	nn	z
x x	x ? F	N	N	C	C	C	EE
x x	D x ? F	H	H	HH	HH	HH	EE
z	D x ? JF	HN	JG	JK	MG	HG	EE
z	D x ? JF	HG	IG	IM	JI	LG	EE
x x	z ? JF	HM	JG	JG	LC	HG	GGI
x x	z ? F	HDP	ICJ	IOH	KKI	PDN	GTN
x	?	HGG	LG	NG	HGG	ILGG	IK
x x	z ? F	GCGG	GGL	GCK	GCK	GCK	GCH

j z            z x z x            x z                    yx            z            z            x z                    X                    Dn                    z x            x    x  
 z x                    z x                    x x E                    z                    x                    z                    x  
 n                    z x                    z x z x                    yx                    x x                    C                    x x  
 z                    z x                    z x                    Ek                    C z x                    x y                    x                    x x x                    x  
 x                    z                    x                    x                    ?                    z x                    Ek                    x x                    x  
 x                    E                    y                    x                    x                    x z x                    x                    D                    x                    x                    x z  
 JMP                    x                    x                    xy                    x                    x                    C                    z                    x                    x                    x                    ?kxy J  
 MG                    x x z x                    x                    Ee x                    I                    x                    x                    x                    E  
 kxy JE                    x                    x                    x x                    x x                    ? HGG

x	nn	nn	nn	nn	nn	z
j l	HLK	HGH	NEN	NK	NL	0.2
e	JINE	IHLG	HMIM	HLMN	HLPB	JNIP
	OP	LLH	KIG	KGE	KGP	NM
Dn	JMK	IJP	HOE	HNEK	HNN	11.4
d	JHN	IGD	HLP	HLE	HJK	9.7
K	HK	GP	GEN	GEN	GEN	HH
I	IJHL	HLHO	HLLH	HHGLP	HHIKJ	JLLOM

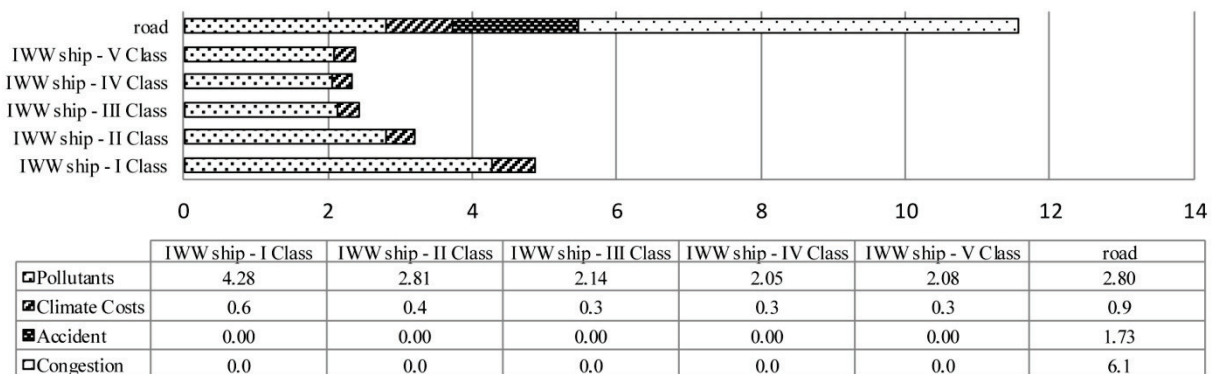
j z            yx                    r LCM  
 x                    x                    x z x                    x x                    yE                    z x                    C  
 rN                    x                    z    z                    x                    z                    x x  
 x                    xy                    JG                    x    x                    x  
 x x                    E                    x y                    x x x                    x                    x                    E d x                    x xy  
 x                    x xy                    z    z                    HG                    C  
 x                    x xy                    x x                    X e                    y                    x                    x                    HGG                    rJHC                    z  
 z x                    ?kxy I EX                    x                    x                    x  
 x    x                    x                    x                    x

xz x x x z x x z z y  
 x x z x E d C x x C xx x x  
 z x Ej z HPCN x GIEIHK HG z D E  
 G x x y C z k x x zx yx x  
 x y x z x y x z x x x  
 z x x E x z m x x E zx x yxy x  
 x x z x x xzz x D  
 JG x E m x D z kxy KE  
 kxy KE y xx x x zx

i x zx	e y xx ?HGN z D		e y ?HGN z D	
	Xj i j	X x yx X	Xj i j	X x yx X
x x x ?I I x C z	GEKN	GEK	GEKG	HNO
d x x ?I I x Cz x C xx x	GEKI	GEI	HELI	
d x x ?I I x Cz x C zx D xx	GELOH		IEMK	
d x x ?I Hx Cz x	GEKPH		IEGO	

j z xzx x x yx rHCO  
 x xy X x z x  
 KGG F n D OG x x x x x x x x  
 mEc x z x x x z yxy x xzz x  
 y MM ? HG F n ErJI x x z x y x  
 k x x zx yx x x x x x E xzz x z  
 x z x x z x z xzz C  
 z D x ?xy M y x C x x z x y x  
 z x IG y z x HG y x z z z x z x  
 x Ek x x x z z z x z xzz ? HE  
 Dx NG y zx E IGHG x z x  
 x x x x x x x z x x x  
 x xzz C HKHM x x x z z x Dn x x z x  
 z IO x Ei x xzz x x E  
 x z HHIM EXzz

euro/1000tkm



HI x z x y x x x x x x  
 j z

d C z x ID x  
 CEE dxz C z x  
 x z  
 x x x l x x E

KE e cl j e j  
 k x x x xz z x  
 z x y x x z x x  
 y x x  
 z EX x z xy x x x  
 x x x x x  
 x Cy x xz  
 x z x x x xx x  
 xzz x z C z  
 x x zz Ek z  
 x z xxy E x zx  
 x zx x z x z x  
 x x x y x z y E  
 j z z zx x x xz  
 x x x E x z  
 x x x zx z y z  
 x x z x  
 z x Cy x x  
 y z x zx xz x x  
 E x z zx  
 xx x x x z x  
 zx y z x  
 ? x C x C x  
 x x C x Ek  
 z z z z  
 z x xz E  
 X x z z C x x z  
 x xz x z x E

X e n c d e k j  
 k z x y e x x j z z  
 x zx yx z D

IGHGLF F jKGGMNE

i i e j  
 rH i n e i pXe cE xx xx  
 x x z x z C  
 x xz X i JHC  
 IIMIJJGGHE

rJ mXe j j e i c j j e i d k d mXe  
 i e j m e XEXXi e e j i d i j  
 k i d Xi k e X i j X i c e i i

Xi d j e EX x  
 x C x z x C x  
 z x D x d y x  
 k x d IO DGHG Xz C DKG  
 CIGHE

rK Xe j cE i mc i Xe j e i  
 k i j i i e c j e i c  
 xz x z  
 C i y x k x o l y x k x x  
 k I H C X x z

rL k x Gm EHKGGIE  
 Xe j cE e i C c k i j i  
 n l p k j x z x D z  
 x x y C i y x k x m C  
 l y x k x x I H  
 C X x z k x Gm EMI GGGE

rM k n j XE i d x z  
 z x x z  
 x z x C I r x z =

rN k x x C LHHGGHE  
 BAK M. et. al., Costs and fees in transport, WUG:  
 Gdańsk, 2009 [In Polish].

rO k x x x z z x C  
 z x x z  
 x x l C x  
 C z x D x k x D  
 m C d ?PL MPH

rP n x C x x z IGHG  
 k z C C d ?GGH JNG x E

rHG x x i x x  
 x x X z C x  
 x z x x z x  
 C C C d ?GG LK x C  
 IGGGGIO? E

rHH e Xj El zx xzz x x x  
 z k x z z C l z c C  
 IGGIE

rH i x i z D D x  
 k x C l z CIGGIE

rH x z x E l x j ,  
 INFRAS/IWW: Zurich/Karlsruhe, 2004.

rHK x x x dxz ?GGNDGH C  
 x i DC x C  
 k i e C z i x CIGGKE

rHL c i i i i l i j j XE  
 X Xe i l e k XE e X i i  
 c i e i d X i X m i l  
 j i X X i k i X i j i j i  
 TAVASSZY L., Developing Harmonised  
 x X xz k x x  
 z X C x x  
 C i CIGGME

rHM z E j z x C x  
 z z R x k i k  
 k x k x j c  
 x j CIGGIE

rHN Re R X y k x C z x z x x z  
 Xj ij C GG OE x x

rHD Re Ri x x z C x x x x z  
 Xj ij C GG OE z HPPPEI h x

rHP d X X d E j i p i E j l k k i E z z x y x x x  
 mXe j j e E E e E E j d i j i E x x z P J H F R  
 j i k e A., DOLL C., PAWŁOWSKA B., C G G N R d ? I G G N H O E  
 X d E x y x x rJI z z C C N N F J z y H P O N  
 z x z z z x x x x d y  
 x x x d x x z X j x x x x y x x x  
 x k x C C G G N E x x C

rHG x d x k x X D x k x  
 x C i j x C H P P P E

rHc E j l k i j E c E x x  
 i x z X z z x x C  
 x j X x C c C  
 k j C G G M E

rI mXe j j e E E e E E e i c E E X i E mXe e j j d E E  
 VERVOORT K.T.H., ROCHEZ C. Marginal costs  
 x z x x  
 x z x C C G G E

rJ e i o E i d i j k E k z  
 x x x n x x k x C  
 z x D z x x x x j z z K O C  
 I G H E

rK WOŚ K., Development Trends for Inland  
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rM k x C N H G D L C I G G N i x  
 H E x E x E r

rN i k x x R I G H G R l j  
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rO x x z x C I G H G R x  
 z x e x x i x x d x R  
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rP x x y x C r  
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rJG x x x x  
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rJH z x x x x  
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